

EXHIBIT 1

***In re Camp Lejeune Water Litig.*, Master Case No. 7:23-CV-897 (E.D.N.C.).**
Expert Report of Dr. Kyle Longley
December 7, 2024

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I. Introduction.

I am a historian with a specialty in military history and war and society. The purpose of this report is to provide historical information informed by my expertise that may be of relevance for purposes of understanding the historical use of the Marine Corps Base Camp Lejeune as it related to water consumption and use by those on the base.

Here, the unique historical facts occurred in the context of a time period which, for purposes of statutory relevance, extends from August 1, 1953, to December 31, 1987, as per the CLJA statute. The geographical location of relevance is Camp Lejeune, a massive military base in the southeastern United States whose demography consisted largely of many young Marines as well as numerous young spouses and others, including children and civilians.

I have sought to frame my historical investigation by reviewing facts, documents, and oral testimony and history that can inform the topic of the water use at the base by the Marines and their dependents. My understanding is that the Plaintiffs have brought claims alleging that their exposure to certain chemical contaminants in the drinking water at the base contributed to their later diagnoses with certain diseases. I am advised that the chemical contaminants at issue included Tetrachloroethylene, Trichloroethylene, Dichloroethylene, Vinyl Chloride, and Benzene, and that the relevant diseases at issue for the “Track One Plaintiffs” are leukemia, kidney cancer, bladder cancer, Parkinson’s disease, and Non-Hodgkin’s Lymphoma. While my report does not intrude into areas of science, medicine, or environmental engineering outside my area of expertise, I note these facts for purposes of background and context.

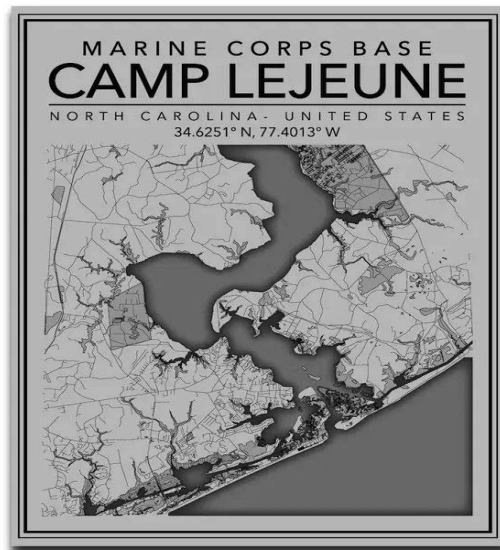
I am advised that the primary contaminated communities/systems per the ATSDR studies and publications with regard to the drinking water issues at Lejeune were three: the Hadnot Point/Mainside barracks region (Hadnot water system), the Tarawa Terrace area (Tarawa Terrace water system), and the Holcomb Boulevard area (Holcomb Boulevard water system).¹ I reviewed other regions and areas of the base and referenced them below as may be relevant. As discussed further throughout the report, my findings include, among others, the following:

1. Designers of the base intentionally directed the occupants to stay within the base boundaries. If occupants spent more time on the base grounds, all else being equal, they had more time exposed to its water, versus during time spent outside the boundaries where they were not exposed to or using the Lejeune water systems.
2. A substantial part of the overall demographic historically was composed of young male Marines (under the age of 25), and they typically lacked cars during much of the relevant time period. They relied heavily on the internal bus system and walking to access different services on base. It was very different from ordinary American environments today in which cars are ubiquitous. This again contributed to the behavior of staying on base.

¹ Technical or engineering issues such as when various water systems fed various piped-water areas such as Camp Geiger, New River, Midway Point, etc., fall outside the scope of this report. ATSDR publications cover the subject.

3. As a related aspect to the base historically being self-contained, there were ample opportunities for social, recreational, and other such events on base, including at facilities geographically located in the Hadnot Point, Tarawa Terrace, and Holcomb Boulevard areas during the relevant time period as discussed further below.
4. Research and investigation into sources of historical records and facts, including access to public record archives, documents produced in the CLJA action, and oral histories and testimony of Marines and spouses, reveals the existence of numerous historical documents and facts reflecting the nature of the water uses on the base during the pertinent times, as summarized below.
5. Certain features of particular areas, such as shower rooms in barracks, motor pools and mechanic buildings, and scullery and mess hall facilities, are correlated to considerable anecdotal reported evidence of the presence of steam and copious water use during the historical time period at issue.
6. Historical records and recollections of Marines' daily tasks, activities, and duties reflect the presence of numerous outdoor activities during warm and hot weather periods, the use of canteens and wheeled water tanks known as water buffaloes, and other such facts. Likewise, historical records document daily-life and social activities of spouses, children, and civilians that involved, for instance, spending time at base-located schools that used base water systems, using recreational swimming pools that used base water systems, and engaging in activities like socializing at clubs, bowling, going to movies, going to buy necessities at the commissary facilities, using medical facilities, and so forth, which gave rise to opportunities for water use.

I reserve the right to supplement my analysis or this report or my opinions based on the receipt of additional information and evidence discovered in the course of this case.



General map layout of the base

II. Qualification of Witness.

I have studied history, with a heavy emphasis on military history, for more than thirty years. I earned a B.A. in history and mathematics at Angelo State University in 1987 and an M.A. in history with a minor in comparative literature at Texas Tech in 1989. From there, I received a Ph.D. in history with minors in anthropology and political science at the University of Kentucky in 1993, where I studied with the internationally recognized expert on the Vietnam War, George Herring. Once I completed graduate school, I taught at The Citadel as a visiting professor before taking a tenured position at Arizona State University, where I spent nearly twenty-five years with a year off to direct the LBJ Presidential Library. In 2020, I joined the faculty at Chapman University to lead the War, Diplomacy, and Society graduate program, which I have done for the past four years. In the past two years, I served as the executive director of the Society for Military History, the leading international organization that promotes the study of military history among more than 3,300 members, including many members of the U.S. government and military.

I have researched and published extensively on a variety of subjects over the years. My publications include eleven books (with a twelfth going to press soon), fifteen long articles and essays, fifteen encyclopedia articles, numerous book reviews, and nearly forty opinion pieces in publications including *Time*, *Newsweek*, *the Washington Post*, *Los Angeles Times*, *Austin American Statesman*, *San Antonio Express News*, *The Dispatch*, and numerous other outlets as well as serving as a consultant to international news organizations including the Associated Press, *JiJi Press*, and the *Jornol do Brazil*. My works have won awards and garnered attention by groups including the State Department, U.S. military academies, and non-governmental organizations that use several of my works for instructional purposes. I have also been invited to speak at such organizations including the State Department (three times), West Point (two times), U.S. Naval Academy, the Infantry Museum at Fort Moore, and others.

The primary focus of my work has been military history with other fields in U.S. foreign relations, modern Latin America, and contemporary U.S. politics. I researched extensively in the field for many of my books, such as those on the Latin American region including *In the Eagle's Shadow: The United States and Latin America* (2002, second edition, 2009) that chronicles U.S. military interventions, primarily by the U.S. Marines Corps, in the region. Subsequent works concentrated on the experiences of soldiers who fought from World War II forward with a special emphasis on those who served in Vietnam and the most recent wars in Afghanistan and Iraq. My two books on combat soldiers in Vietnam focus extensively on the experiences of those recruited and trained in the 1960s, many ending up in Vietnam and cycling through Camp Lejeune. *Grunts: The American Combat Soldier in Vietnam* (2008, 2nd edition, 2020) has been characterized as a "monument" to those who fought in the conflict by reviewers and is used extensively in courses throughout the country, including West Point, and was recommended reading by the Marine Corps. Published in 2015, *The Morenci Marines: A Tale of Small Town America and the Vietnam War*, is a prize-winning book that helped serve as the basis for the PBS documentary, "On Two Fronts: Latinos in Vietnam." It examined the lives of nine Marines from the small copper mining town of Morenci, Arizona, as they proceeded from high school through training and stationing stateside at Camp Pendleton and in Hawaii before heading to Vietnam, where six of the nine died in combat. It is an

in-depth study of the lives of Marines and their service that has become a standard text for sustaining the history of Corps in different ways, including via reading lists published by the Corps.

Subsequent works have continued to focus on the Vietnam War but expanded the topical and chronological scope of the works back to WWII and forward to the most recent wars of the Middle East. The co-authored text, *In Harm's Way: A History of the American Military Experience*, has been utilized by many different universities, including West Point, for their surveys of the American military history. I contributed the final five chapters for the period 1941 to the present. The chapters focus on major innovations in U.S. military policies, including the massive explosion of military bases, both in the United States (and especially the Sunbelt and West) and overseas, the experiences of soldiers in training and combat, and the environmental effects of this expansion, including sections on nuclear testing, Agent Orange, and burn pits. That specialized focus was further developed in my most recent work, *The Forever Soldiers: Americans at War in Afghanistan and Iraq*, being published by the University of North Carolina Press in the Spring/Summer 2025.

Beyond my research, I have taught extensively about U.S. military history over the past two decades, especially to large numbers of combat veterans and ROTC members at both the undergraduate and graduate levels. My most popular courses include graduate seminars in War and Society, the American Way of War, and War and Popular Culture, as well as undergraduate courses on U.S. military history, War and Film, the Vietnam War, and the Guerrilla Wars. My teaching has included discussions of training and daily life on bases, including those on the American frontier which set the tone and laid down core principles for later developments and patterns of base design and infrastructure. It has also focused on the logistical support provided for people by bases stateside especially when the numbers and sizes of bases increased during and after WWI and WWII, and the circumstances of foreign bases ranging from South Korea and Japan to Germany and England and the Caribbean. Despite having taught for more than three decades, the classroom constantly provides ways to integrate existing studies and combine new research into discussions and lectures, helping refine my knowledge and keep it updated. It has also brought me into close contact with major historical international organizations, including the American Historical Association (the world's largest group in that category), the Gilder Lehrman Foundation, the National Endowment for the Humanities, and the Society for Military History, where I have contributed learning materials and, in turn, have benefited from the knowledge of others.

Beyond the classroom and publications, I have also participated as an expert witness in cases relating to immigration, veterans' issues, including a death sentencing case, water rights, and consumer products. Conducting research and writing reports, as well as giving depositions and trial testimony has been a good learning experience that itself has helped develop and refine the processes employed in my work on cases, including this one. All of these efforts have helped me establish a strong reputation in multiple fields, but especially military history and topics related to war and societies. It is a never-ending process of learning and refinement of existing materials and continues through the work such as on this case.

Each of these areas highlights the more than three decades of research and writing I have done to familiarize myself with a plethora of materials available on topics such as military bases and those who served. It is a process that continues each year with my work on new books and articles on

topics related to military service, including, for example, my recent work on burn pits as well as regarding a Marine Reserve unit from Ohio, Lima Company, who fought in Iraq and suffered heavy casualties in 2005 and 2006.

III. History of Camp Lejeune.

There is a long history of military bases in the United States dating back to the colonial period. Naval bases and forts extended across the country through the 19th and 20th Centuries. Often isolated from major urban areas, these were self-contained and sustaining entities sponsored by the U.S. government through housing and food subsidies for the soldiers and their families who joined them. They were, in essence, small towns that became massive over time, and which in relevant respects grew to resemble the counties spread throughout the United States, developing their own schools, hospitals, churches, and entertainment and recreational facilities on-base. Often, indeed, people lived some or all of their whole adult lives on the bases, cut off from the outside world by distance and even language barriers in foreign lands. By World War II, these military bases had long-established histories that defined the way new bases such as Camp Lejeune evolved and were constructed and demographically designed.²

As the Nazi threat loomed in Europe and the Japanese Imperial Army waged a war in China, the United States began preparing for conflict in the late 1930s. By 1940, our nation had begun a massive building project of bases throughout the country. This included the Marine Corps, a group for which the government significantly increased its maximum strength during that time. To handle the changes and coordinate with the Marine Recruiting Depot at Parris Island, South Carolina, planners selected a portion of Onslow Beach and nearby areas to begin building a base in April 1941. The planned space ultimately encompassed 11,000 acres on marshy lands with tidal basins. On May 1, 1941, Marines and contractors began the construction, which had its first headquarters at Montford Point before settling at Hadnot Point in 1942.³

² Alexander Humes, “Fortified Arguments: Fortifications and Competing Spatial Views of Colonial North America,” Ph.D. dissertation, University of Virginia, 2021; David La Vere, *The Tuscarora War: Indians, Settlers, and the Fight for the Carolina Colonies* (University of North Carolina Press, 2013); M. Patrick Hendrix, *A History of Fort Sumter: Building a Civil War Landmark* (History Press, 2014); William Whittaker, ed., *Frontier Forts of Iowa: Indians, Traders, and Soldiers, 1682-1862* (University of Iowa Press, 2009); Ethel Jackson Price, *Fort Huachuca* (Arcadia Publishing, 2004); Robert Wooster, *Frontier Crossroads: Fort Davis and the West* (Texas A&M Press, 2005); Katherine A. Zien, *Sovereign Acts: Performing Race, Space, and Belonging in Panama and the Canal Zone* (Rutgers University Press, 2017); Stephen Irving Schwab, *Guantanamo, USA: The Untold History of America’s Cuban Outpost* (University of Kansas Press, 2009); Matthew D. Rector, *The United States Army at Fort Knox* (Arcadia Publishing 2005); Peggy A. Stelpflug and Richard Hyatt, *Home of the Infantry: The History of Fort Benning* (Mercer University Press, 2007); Rebecca Herman, *Cooperating with the Colossus: A Social and Political History of U.S. Military Bases in WWII Latin America* (Oxford University Press, 2022); Kenneth MacLeish, *Making War at Fort Hood: Life and Uncertainty in a Military Community* (Princeton University Press, 2013); John W. Lemza, *American Military Communities in West Germany: Life in the Cold War Badlands, 1945-1990* (McFarland, 2016); Jonathan Stevenson, *Overseas Bases and U.S. Strategy: Optimizing America’s Military Footprint* (Routledge, 2022); Catherine Lutz, *The Bases of Empire: The Global Struggle Against U.S. Military Posts* (New York University Press, 2009).

³ Gertrude Carraway, *Camp Lejeune Leathernecks* (Owen G. Dunn Company, 1946); U.S. Marine Corps, “History,” <https://www.lejeune.marines.mil/Visitors/History/> [accessed 16 October 2024]; William Darden, “Camp Lejeune,” in *United States Navy and Marine Corps Bases* (Greenwood Press, 1985), 67-71.



Marines Training, WWII

It was a massive undertaking, but the changing geopolitical conditions, such as in Asia, required a massive expansion of Marine capabilities. Authorities also began building a massive base at Camp Pendleton in southern California. The Defense Department appropriated over \$14 million (in 2024, the equivalent would be \$304.5 million) for Camp Lejeune, and engineers and construction workers began the massive undertaking under the command of Lieutenant Colonel P.T Hill to design the base after the resettlement of over 600 farm families that formerly occupied the area.⁴ Quickly, construction started for the headquarters of what became the 2nd Marines (and later, the 6th and 8th Divisions as well), including Marines who distinguished themselves in battles at Guadalcanal, Saipan, and Okinawa.⁵

Almost overnight, the base grew from a tent city into a massive training base for those cycling out of Parris Island and preparing for deployment to the Pacific Theater.⁶ The engineers and contractors worked tirelessly to provide for matters ranging from clearing and grading, drainage for roads and streets, sewers and disposal plants, to water supply storage and distribution systems,



Marine training for amphibious assaults at Camp Lejeune, Marine Corps Archive

and steam plants.⁷ Barracks, housing, administration buildings, and mechanical and maintenance shops arose to support the U.S. war effort. The base grew throughout the conflict as tens of thousands of Marines received training for deployments into some of the worst fighting in the South Pacific.⁸ Camp Lejeune added an air naval station in 1944 at New River that also trained Marine paratroopers and glider Marines. Across the base, buildings and housing sprung up along with warehouses, administrative buildings, and mechanical shops throughout the war until it ended in 1945.⁹

⁴ Herb Richardson, "Home Sweet Home," *Leatherneck*, 59:8 (August 1976): 22-23.

⁵ Thomas Loftfield, *An Archaeological and Historical Reconnaissance of U.S. Marine Corps, Camp Lejeune* (U.S. Department of Navy, 1981); Jeter A. Isely and Philip Crowl, *U.S. Marines and Amphibious Warfare* (Princeton University Press, 2016).

⁶ Billy Arthur, "Camp Lejeune-The Early Days," *Leatherneck*, 65:11 (November 1982): 28-31, 69.

⁷ The Marines outlined their efforts in great detail. The reports and plans reside in folders: "Clearing, Grading, and Drainage," (Folder P-1-1), "Roads and Streets," (Folder P-1-2), Phase II Redeployment Box II for Creation of Camp Lejeune, post-1942, Marine Corps Archives, Quantico, Virginia.

⁸ Harry Polete, "Posts of the Corps: Camp Lejeune," *Leatherneck*, 31:9 (September 1948), 27-29.

⁹ Edward J. Evans, "Esprit de Camp," *Leatherneck*, 30:10 (October 1947): 7-8.



Construction at Camp Lejeune during World War II (Courtesy of the U.S. Marine Corps Archives)



The building of homes at Camp Lejeune

While the United States historically demobilized following a major conflict like WWI, the quarrels after 1945 with Moscow often required expanding the branches of the military, including the Marines, during the Cold War.¹⁰ The Korean War saw another major buildup of Camp Lejeune as the Marines played a substantial role in the massive conflict from 1950-1953.¹¹ Thousands of volunteers and draftees flocked to Camp Lejeune and lived on the base during the conflict, often with their families. Increasingly, retirees settled in the area, taking advantage of the medical facilities and Post Exchange (PX) where people bought everything from groceries to clothes at reduced prices compared to their civilian counterparts.

By 1955, the base had grown significantly since its inception fourteen years earlier. One observer, reporting about the sheer enormity of the base, noted that it included “145 miles of electric distribution lines, 112 miles of telephone cables and 165 miles of telephone lines connecting the eight telephone exchanges . . . which provide service to 3700 telephones.” A modern road system of “130 miles of paved highways and more than 500 miles of unpaved roads accompanied 90 miles of sidewalks.” He also added that they had a bakery capable of producing enough bread in an eight-hour period to feed a city of 50,000 people.¹² Many people marveled at the base’s size and services, both within and without the Marine Corps.

One of the most important infrastructure projects at the base from the outset was the water works. When construction began, it was a struggle to find large quantities of drinking water, especially during the summer when temperatures soared, and rivers dried out. The Marines built a water well pumping system among the several freshwater aquifers under the base, including the Castle Hayne aquifer that ran under the sandy soil at depths ranging from 150 to 400 feet. There were issues, including when the Marines used the aquifer more in the hot and humid summer months. The salt content of the water required significant treatment, and over the following years, the demand grew along with the need to continue to filter salt and impurities from the water. By the mid-1950s, the Marines boasted Lejeune had an “ultra-modern water treatment plant . . . capable of purifying 5,000,000 gallons of water daily.”¹³ Ultimately, the Marines reported building 100 or more wells that required more than 1,500 miles of pipe to supply more than 7,000 buildings.¹⁴

¹⁰ Aaron B. O’Connell, *Underdogs: The Making of the Marines Corps* (Harvard University Press, 2012).

¹¹ Charles R. Smith, *U.S. Marines in the Korean War* (Marine Corps Press, 2008).

¹² *The Globe*, 28 July 1967; Robert T. Fugate, “Camp Lejeune,” *Leatherneck*, 38:4 (April 1955), 19.

¹³ Fugate, “Camp Lejeune,” 19.

¹⁴ The Marines outlined their efforts in great detail. The reports and plans reside in folders: “Sewers and Disposal Plant,” (Folder P-1-3), “Water Supply Storage and Distribution,” (Folder P-1-4); “Steam and Hot Water Plants and Distribution,” (Folder P-1-10), Phase II Redeployment Box II for Creation of Camp Lejeune, post-1942, Marine Corps Archives, Quantico, Virginia; Mike Magner, *A Trust Betrayed: The Untold Story of Camp Lejeune and the Poisoning of Generations of Marines and Their Families* (DeCapo Press, 2014), 30-31.

Camp Lejeune, along with Camp Pendleton, remained the main training and home station of the Marines throughout the 1950s and into the mid-1960s, its troops deploying across hotspots in the world from Lebanon in 1958 to the Dominican Republic in 1965. The base expanded even more during the heaviest fighting of the Vietnam War, from 1965 to 1970.¹⁵ Thousands of young men flooded the training facilities, many heading to Vietnam as replacements for those killed or completing their tours of duty.¹⁶ Many received training on how to behave if captured, a problem dating back to the Korean War.¹⁷ It was a period of challenges and unrest on bases including Camp Lejeune, as race riots swept the base in July 1969, reflecting divisions in society boiling over during that historical period.¹⁸

The buildup during the Reagan years continued for the military, including the Marines who continued to prepare for military potentialities including, among others, conventional conflicts with Russia and, later, China, or others or their proxies. The size of the Camp Lejeune base increased by an additional 41,000 acres during this period, as it added more firing ranges and storage facilities to meet the demand, giving it more than fifty tactical landing zones, thirty-four gun positions with ranges for those firing from naval craft positioned offshore, and enhanced military operations facilities. Ultimately, the growth continued, culminating with the First Persian Gulf War in 1991 when the Marines played a significant role in efforts to drive out the Iraqis from Kuwait, although it was a short conflict with limited casualties. The importance of the base during the wars in Afghanistan and Iraq during the early 21st Century has only enhanced its visibility and importance to American policymakers.

IV. Water Development and Usage Background.

When constructing Camp Lejeune in 1942, one of the first major challenges planners faced was the need for water supplies for the thousands of people who soon occupied the base during WWII and on into the Cold War when manpower needs remained much higher than previous peacetime requirements. It was a constant struggle to keep the base supplied with water, and issues arose over the years as it expanded and more people lived and interacted on base.

Every day, the residents of this burgeoning society used water in their homes or when they left to go to training, to work in various administrative and mechanical offices on base, or to teach or learn at school. They used water when they went to shop or to staff counters and cash registers, when they went to be entertained at clubs, or when they participated in recreational activities. These attractions occurred all over the base, but mainly in the large daily living areas of the

¹⁵ *The Globe*, 31 January 1969.

¹⁶ U.S. Marine Corps, "DoD Picks Marine Bases," *The Marine Corps Gazette*, 50:10 (October 1966): 1.

¹⁷ Photographs of POW Training, P&S: Camp Lejeune, NC-CLNC/POW School, U.S. Marines Archive, Quantico, VA.

¹⁸ U.S. Marine Corps, Black Marines Reference Collection, 5958, A/33/K/3/3 Box 3 of 6; House of Representatives, "Inquiry Into the Disturbances at Marine Corps Base, Camp Lejeune, N.C. on July 20, 1969," Report of the Special Subcommittee to Probe Disturbances on Military Bases, Committee on Armed Services House of Representatives, Ninety-First Congress, First Session, 15 December 1969 (U.S. Government Printing Office, 1969), pp. 5051-5059.

residential communities and barracks and centrally at the area of Hadnot Point, which functioned metaphorically as the nervous center of the body of the base at large.

Water consumption in the 1950s through the 1980s at Camp Lejeune and throughout the country had its roots in massive changes that took place in the 20th Century. At the turn of the century, most Americans secured their water through wells on their farms, natural springs, or rivers. Increased urbanization, however, changed the way people secured their water, often shifting reliance towards pumping, canals and aqueducts to send water to treatment plants. Soon, major public work projects that focused on underground delivery of water became the norm in most cities and suburbs sprouting up around the country.

The local water supply at Camp Lejeune, created in 1942, underwent expansion as the base became larger over the years, and relied heavily on relatively shallow wells. Engineers laid hundreds of miles of pipes to distribute water from to thousands of buildings from numerous wells dug to provide water supplies. These expansions continued throughout the base's history, with many more miles of piping built, new water treatment plants constructed, and additional expansion to incorporate facilities to reach the tens of thousands of Marines and their dependents.¹⁹



Water Treatment Plant near Holcomb Boulevard, 1960s

The distribution of water during the period from 1942 through the late 1980s was simpler than today. While, today, people rely on bottled water, many different types of sodas and other drinks, and filters, even in public locations, the same was not true in the 1950s, 60s, 70s and 1980s. Back then, most people drank tap water from the faucet, or used it to create teas, coffee, or a favorite of many people, sweetened Kool-Aid, and later, Gatorade.²⁰ There were water fountains in the barracks, the schools, the shops on base,

the main administrative buildings, and at the hospital complex. There were even hoses across the base to distribute water from the main water supply to stations where Marines could fill up canteens and jugs. There were also distribution points for water buffaloes to fill.

Many Marines and their dependents drank from the water fountains provided around the base as well as from hoses and jugs spread across Camp Lejeune. The only equivalent to today's wide selection of bottled drinks would have been the canteens that the Marines carried. However, they filled these canteens with base tap water from taps, commonly found in the logistics support areas, primarily at Hadnot Point, or from the big jugs of tap water stationed around base to provide for the Marines during training.²¹

¹⁹ Comprehensive relevant information on the technical details of the water systems at the base is found in the voluminous publications of the ATSDR on the subject of the base and its water.

²⁰ Video Deposition of Allan Wayne Howard, Dayton, Ohio, 16 February 2024, p. 29-30 [hereafter Howard Deposition].

²¹ Oral History via Zoom with Alan Howard, 30 August 2024.

To highlight the importance of water to the planning and operation of a military base, one 1999 report put out by the Army on water consumption had a cover page proclaiming that “the ultimate weapon runs on WATER.”²² The report included numbers and statistics on how much of this necessity it would take to run a successful operation based on a variety of detailed estimates. For example, calculations reflected a “central hygiene standard of 2 showers and 15 pounds of laundry per soldier per week.” The report listed statistics for teeth brushing (0.2 gallons per soldier per day), shaving (0.25 gallons per soldier per day), washing hands (0.75 gallons per soldier per day), and total general personal hygiene (1.7 gallons per soldier per day). The bottom-line takeaway from the document was that water is crucial to a functioning military operation.

V. Marines Stayed on Base, Specifically at Mainside -- Hadnot Point.

a. Size and Scope of the Base.

Newcomers often compare Camp Lejeune to a city with its facilities, housing operations, and many consumer services. However, a more appropriate analogy would be that the base is like a county, covering more than 240 square miles and encompassing 153,439 acres with 14 miles of oceanfront. It is bigger than many counties in North Carolina, including Alleghany (on the North Carolina and Virginia border) and Avery (north of Asheville) counties. In addition, the base covers a land area equivalent to or larger than several big cities in North Carolina, such as modern Raleigh (144.8 square miles), and in fact is only surpassed by Charlotte (297.7 square miles). The base’s current population of 33,422 (2022) makes it the 33rd largest city in North Carolina.²³

b. All-Encompassing Nature of the Base.



Fire station at Camp Lejeune

The base, just like any other large governmental entity, required a sophisticated organizational structure to maintain and manage the facilities, create security, administer logistics, and enhance the living experience for the mainly volunteer force. The base infrastructure historically required large numbers of workers, including civilian ones, to maintain and sustain the complex community, with its core mission to serve and protect the United States.

²² Study Report Water Consumption Planning Factors,” Directorate of Combat Developments (Quartermaster) U.S. Army Combined Arms Support Command, Ft. Lee, VA, June 15, 1999.

²³ North Carolina Department of Military and Veterans Affairs, “Military Bases in North Carolina,” <https://www.milvets.nc.gov/benefits-services/military-bases-north-carolina#:~:text=Camp%20Lejeune%20occupies%20about%20153%2C439,the%20Marine%20Corps%20expeditionary%20abilities>. [accessed 8 October 2024]; Kristen Carney, “North Carolina Cities by Population (2024),” *North Carolina Demographics*, 20 June 2024, https://www.northcarolina-demographics.com/cities_by_population [accessed 8 October 2024]; “North Carolina Land Area County Rank,” *USA.com*, <http://www.usa.com/rank/north-carolina-state--land-area--county-rank.htm> [accessed 8 October 2024].

To ensure the efficiency of the base and its Marines, the Marine Corps and Navy provided almost all basic services. There were civilian-staffed fire stations built and operated on the base. The Marines provided a security apparatus against crimes, such as robberies, drunk driving and domestic violence. The base had its own jail that could house numerous inmates and a judicial system that could hand down sentences. Administrative offices provided services such as housing inspection, banking and financial management, and data processing for everything from paychecks to bills to various PXs and clubs. The employees who worked at these establishments, some civilians, helped keep the base running efficiently and within the parameters constructed by congressional oversight committees and the Department of Defense.



Midway Park Commissary in 1949 (Courtesy of the Marine Corps Archives, Quantico, VA)

From the start, the goal was to keep the Marines on base, spending their time and money there to prevent challenges from developing between sometimes rowdy Marines and locals, to keep the Marines happy and engaged with the military sources of entertainment, and also importantly, to keep their funds cycling back through U.S. military PXs, restaurants, and cultural entities into military budgets which became relatively self-sustaining over time in light of Marine pay and savings on housing, foodstuffs, and cultural activities.



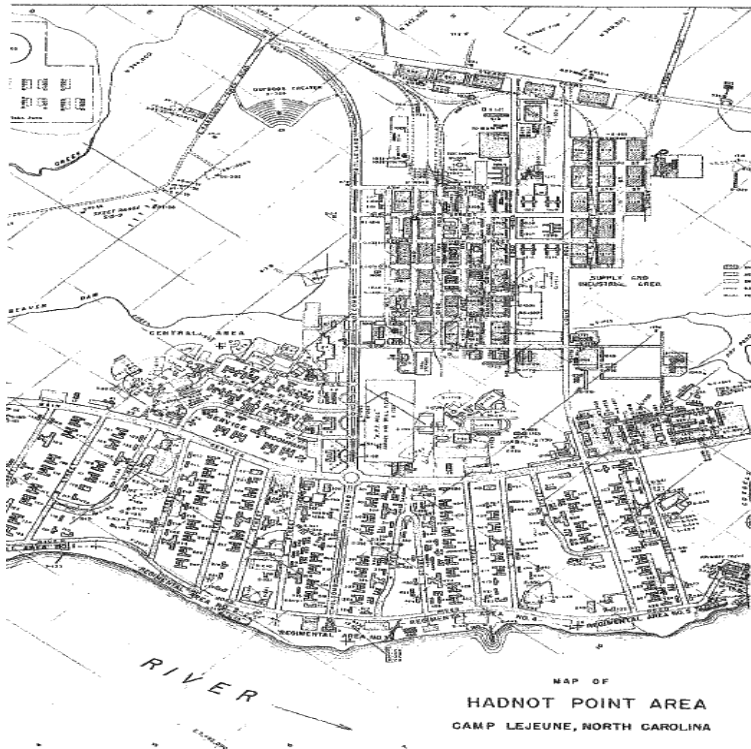
I CROWN THEE—Mrs. Mary Goodson, wife of a Marine acting staff sergeant, and part-time attendant at the commissary nursery, makes paper crowns for dependent children left in the nursery while their parents shop for groceries. (Photo by Act. Sgt. W. J. Rush)

Children at playground at Main Commissary as their parents shopped, *The Globe*, 19 May 1966

The Marine Corps wanted to prevent the residents of Camp Lejeune from feeling a need to leave the base, where the Marines exercised better control, and to go to the surrounding communities such as Jacksonville; this also kept money in government coffers. To that end, the Marine Corps, in designing and building the base over the years, worked hard to provide many opportunities for the Marines and their families for entertainment, recreation, and socialization. One writer for *Leatherneck* magazine noted in 1955 that “it’s doubtful whether those hardy troopers who pitched their tents in the mud of Verona Road and fought the first battle of chiggers in 1941 remember Camp Lejeune as a veritable vacation paradise.” However, he added: “Fourteen years later, the off-duty merriment” made available by base facilities made it “the world’s most amphibious playground.”²⁴

²⁴ Robert A. Suhosky, “Recreation (at Camp Lejeune),” *Leatherneck*, 38:4 (April 1955): 25.

c. The Centrality of Hadnot Point.



Historical map of Hadnot Point area



Changing of colors on
parade ground



President Nixon at main parade
grounds, 30 Oct. 1971

Hadnot Point was the nerve center of Camp Lejeune, replete with schools, barracks, stores, and mess halls. Regardless of where they lived, people naturally regularly traveled back and forth between their homes and work, school, military or other activities, including the main attractions at Hadnot Point, such as the hospital, main PX, churches, and parade grounds for events.²⁵ Marines, their family members, and others were present and consuming the water at Hadnot Point, regardless of whether or not they had their homes or barracks there.

There were many activities that attracted service members and their families to Hadnot Point and its playing fields, gyms, social clubs, theaters, riding stables, golf courses, boathouses, complete with ski and

sailing boats and canoes, and other amenities. For many young Marines, coming from modest economic backgrounds and rural regions, the base offered more amenities than they had experienced before in their young lives. The Marines wanted them to have ways to interact with each other and build *esprit d' corps* while staying out of trouble and spending their money at base commissaries and clubs.

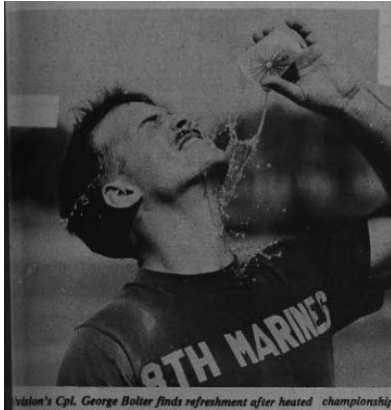
One of the most prominent gathering spaces on base was Hadnot Point's main parade grounds. Here, crowds would gather for many events, including change of command parades and ceremonies, the Fourth of July, returns from overseas deployments, and other formal occasions like President Nixon's visit to the base in 1971.²⁶ The parade grounds also hosted the major reviews for the Marine Corps Birthday bash, traditionally held on November 10, which included many ceremonies and

²⁵ *The Globe*, 2 January 1970.

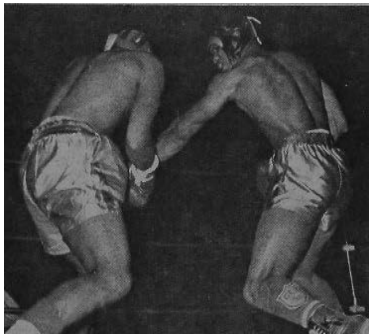
²⁶ U.S. Marine Corps, "Nixon's Visit to Camp Lejeune," 30 October 1971, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina.



Football between units, *The Globe*,
6 Jan. 1966



Soccer match on base, *The Globe*,
25 Aug. 1983



Ken Norton, fighting at Camp
Lejeune, *The Globe*, 6 Jan. 1966

dances to honor the establishment of the Marines at Tun Tavern in Philadelphia. Thousands often descended on the base to celebrate the special day.²⁷ On such occasions, people consumed large quantities of beverages, including water, iced tea, punch, and alcoholic drinks. The food, prepared by the base kitchens and bakeries, fed the participants who often had accompanying dances and other special activities.

Oftentimes, people congregated at Hadnot Point as it hosted intramural-style games and major events for popular sports, including basketball, baseball, and football.²⁸ In the 1950s and 1960s the Camp Lejeune football games drew 12,000 spectators as they competed against other bases and also universities, including DePaul and Elon.²⁹ In addition, the Goettge Memorial Fieldhouse hosted multiple basketball games, and its optimal floor arrangement meant that 4,000 spectators could pack the gym.³⁰ Some Marines played in leagues, including bowling (there was a 32-lane alley at Mainside) and tennis and joined in many other sports such as equestrian competitions, tennis, racquetball, handball, and golf.³¹ The sports extended beyond the adults and to the children.³² Sporting events filled up the week and provided the Marines with opportunities to participate as well as observe and support their units, who often fielded teams in the major sports, allowing for some healthy competition and further creation of an *esprit de corps*.³³

Beyond the semi-professional teams and intramural sports, a profusion of other opportunities for recreational activities existed for the Marines and their dependents on base. For example, Camp Lejeune had a variety of gyms with weight-lifting facilities, which, over time, grew to include equipment that most modern gyms had at the time, such as Nautilus machines, treadmills, and stationary bikes.³⁴ When off duty, Marines also followed societal trends that developed, including jogging and preparing for long-distance races. In all places, people ate food and drank water and other

²⁷ *The Globe*, 30 June 1977.

²⁸ U.S. Marine Corps, "Baseball at Camp Lejeune," 6 September 1952, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina. Retired Master Sergeant Ensminger relates that in addition boxing was a popular sport, with numerous Marine boxers some of whom even achieved prominence in forums such as the Olympics. Boxing was featured at facilities such as Goettge Fieldhouse in Hadnot Point.

²⁹ *The Globe*, 10 May 1957; *The Globe*, 31 January 1969; *The Globe*, 6 October 1977.

³⁰ Herb Richardson, "Post of the Corps," *Leatherneck*, 51:9 (September 1968): 27.

³¹ Herb Richardson, "Post of the Corps: Camp Lejeune, N.C.," *Leatherneck*, 64:10 (October 1981): 39.

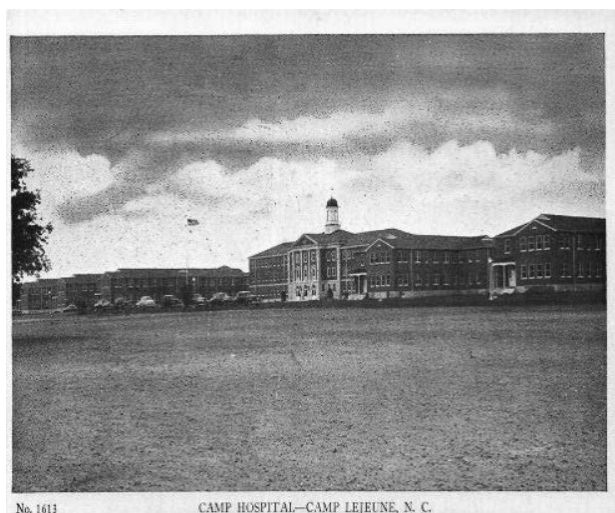
³² *The Globe*, 27 October 1977.

³³ *The Globe*, 8 October 1953.

³⁴ *The Globe*, 9 March 1967; *The Globe*, 29 September 1977.



Announcement for Frank Sinatra, Jr. performing on base, *The Globe*, 6 January 1966



Main Hospital (facility used through 1983)

beverages, especially in high-exertion activities such as distance running or flag football. While smaller clubs and theaters dotted the base, the main ones were at Hadnot Point. Its theaters hosted a number of major entertainment events, such as the Christmas concert by the internationally respected Marine Corps Band. The different venues in the area, such as the SNCO Club, hosted many popular entertainers, such as Frank Sinatra, Jr., Lou Rawls, Nancy Rowe, Jesse James, and the Country Outlaws, and diverse celebrations, including the Bavarian Festival Show Band during Oktoberfest.³⁵ Entertainment also was offered in smaller venues such as the clubs and other places for social gatherings and relaxation. Both Marines and family members as well as civilians had access to such resources at Hadnot Point.

The base, and especially Hadnot Point, provided major services to the Marines and their dependents, including free and low-cost medical care, something few Americans had until the 1970s and 1980s. In the 1950s, Hadnot Point's fully staffed Naval Hospital covered 144 acres and had room for more than 1,074 patients.³⁶ It grew as manpower needs increased during the Vietnam War when more casualties returned from the heavy fighting. The hospital provided healthcare to all the Marines, their dependents, and when available, retirees who had settled in the area. The Navy, well known for its medical corps, via the hospital complex offered everything from basic physical exams to emergency room service to gynecological

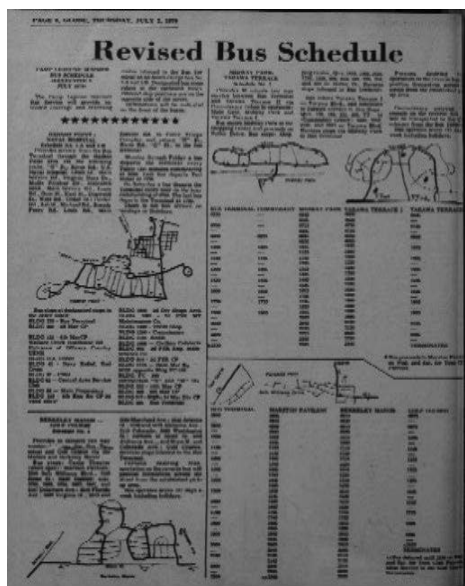
check-ups for women to surgeries and even malaria treatments, which some soldiers contracted while serving in the sometimes swampy conditions at the base.³⁷ At the hospital, doctors performed surgeries, including some complex ones, and the hospital hosted numerous births, especially nine months after a major deployment ended and the Marines returned home. It was a full-service hospital, the envy of many communities surrounding the area and one of the best in the Southeastern United States.³⁸ Over time, the facility was rebuilt, and by 1983, the new hospital,

³⁵ *The Globe*, 8 September 1977; *The Globe*, September 15, 1977.

³⁶ Fugate, "Camp Lejeune," 19-20.

³⁷ "Naval Medical Center Camp Lejeune Celebrates 75 Years of Care," Defense Visual Information Distribution System, 1 May 2018, <https://www.dvidshub.net/news/278247/naval-medical-center-camp-lejeune-celebrates-75-years-care> [accessed 21 October 2024]; U.S. Marine Corps, "Naval Hospital and Surgeon's Row" (Camp Lejeune), <https://www.lejeune.marines.mil/Offices-Staff/Environmental-Mgmt/Cultural-Resources/Historic-Architecture/Districts-Buildings/Naval-Hospital-and-Surgeons-Row/> [accessed 21 October 2024].

³⁸ *The Globe*, 10 May 1957.



Bus Schedule (*The Globe*, 2 July 1970)

a \$45.3 million facility on 162-acres, handled nearly 8,000 admissions a year and over 540,000 outpatient visits. It boasted a computer-based control system to monitor security and transfer heat and cooling throughout the complex and 205 beds, expandable to 236 if needed.³⁹

A complex bus system linked the various neighborhoods to Hadnot Point so that residents could access the latter's medical care, groceries, dry goods, banking, clubs, churches, and other main attractions as discussed above. As in many small counties and towns across the country through the 1970s and 1980s, the main bus station, located directly across from Hadnot Point's water treatment plant, served as the transportation hub that brought people to the PX system and across the community. To provide a sense of the scope of use of the bus system, over six months in 1977, Camp Lejeune's PX system grossed more than \$22.8 million [over \$118 million in 2024 dollars].⁴⁰ The bus station at Hadnot

Point was crucial in the 1970s and 1980s before the advent of affordable and accessible alternative means of transportation. Air travel to go on leave was expensive, and few could afford luxuries such as cars. Most of the base relied on buses and walking to access their basic needs for groceries, clothes, and other goods and movement to entertainment and religious services, at least through the 1980s. The average price of a car in the 1960s was \$2,650 with additional costs, including \$50/month for insurance, maintenance, and gasoline.⁴¹ Contrast that with the fact that, in 1965, a private first class earned \$97.50 a month (\$136.50 if a person served more than 2 years).⁴² For most Marines at Camp Lejeune outside of officers, buying a car was cost-prohibitive, so buses were key to movement on and off base.

Walking constituted another major mode of transportation, just as it did for many Americans at the time without access to cars. People traveled to bus stops and then walked the rest of the way to the many facilities provided by the Marine Corps, especially in the Hadnot Point area. This reliance on walking and public transportation also largely explained why many Marines lived within the center of the base in the barracks at Hadnot Point, as further described below.

No matter where a person lived on base, and even for the small number of Marines that sometimes lived in off-base housing, Hadnot Point was the functional "county seat" for Camp Lejeune, and people frequented it daily in many cases. They traveled there for major shopping trips at the

³⁹ P. L. Thompson, "Camp Lejeune's New Hospital," *Leatherneck*, 66:5 (May 1983): 46-47; U.S. Marine Corps, "New Medical Center at Camp Lejeune," *The Marine Corps Gazette*, 66:11 (November 1982): 15.

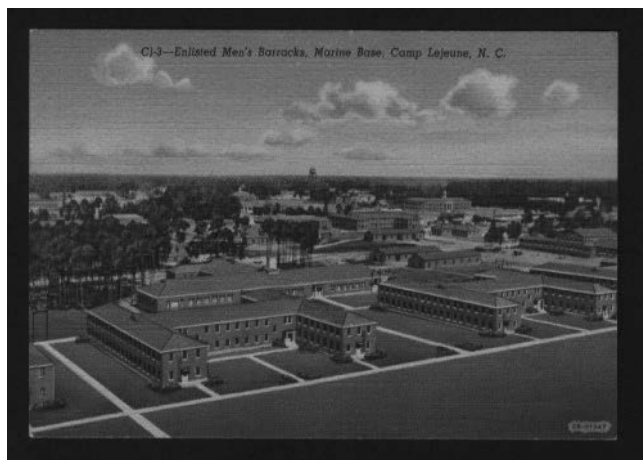
⁴⁰ U.S. Marine Corps, "Command Chronologies, July 1977-December 1977," U.S. Marine Corps Archive, Quantico, VA., 44-48.

⁴¹ "Average Price of a Car in 1965," *Worldmetrics*, July 24, 2024, <https://worldmetrics.org/average-cost-of-a-car-in-1965/> [accessed 27 September 2024].

⁴² Defense Finance Accounting Service, "Military Pay Tables 1965," 1 September 1965, <https://www.dfas.mil/Portals/98/MilPayTable1965.pdf> [accessed 27 September 2024]

government subsidized PX, recreational opportunities for themselves and their children, medical and dental care, cultural exchanges that were plentiful in the base theaters, and other activities, including religious ones. Many worked in the buildings that housed mechanical shops, administrative offices, and that served other important functions that kept the base working efficiently in preparation for the next deployments of its Marines to distant duties.

VI. The Mainside Barracks at Hadnot Point.



Aerial view of main barracks circa early 1960s



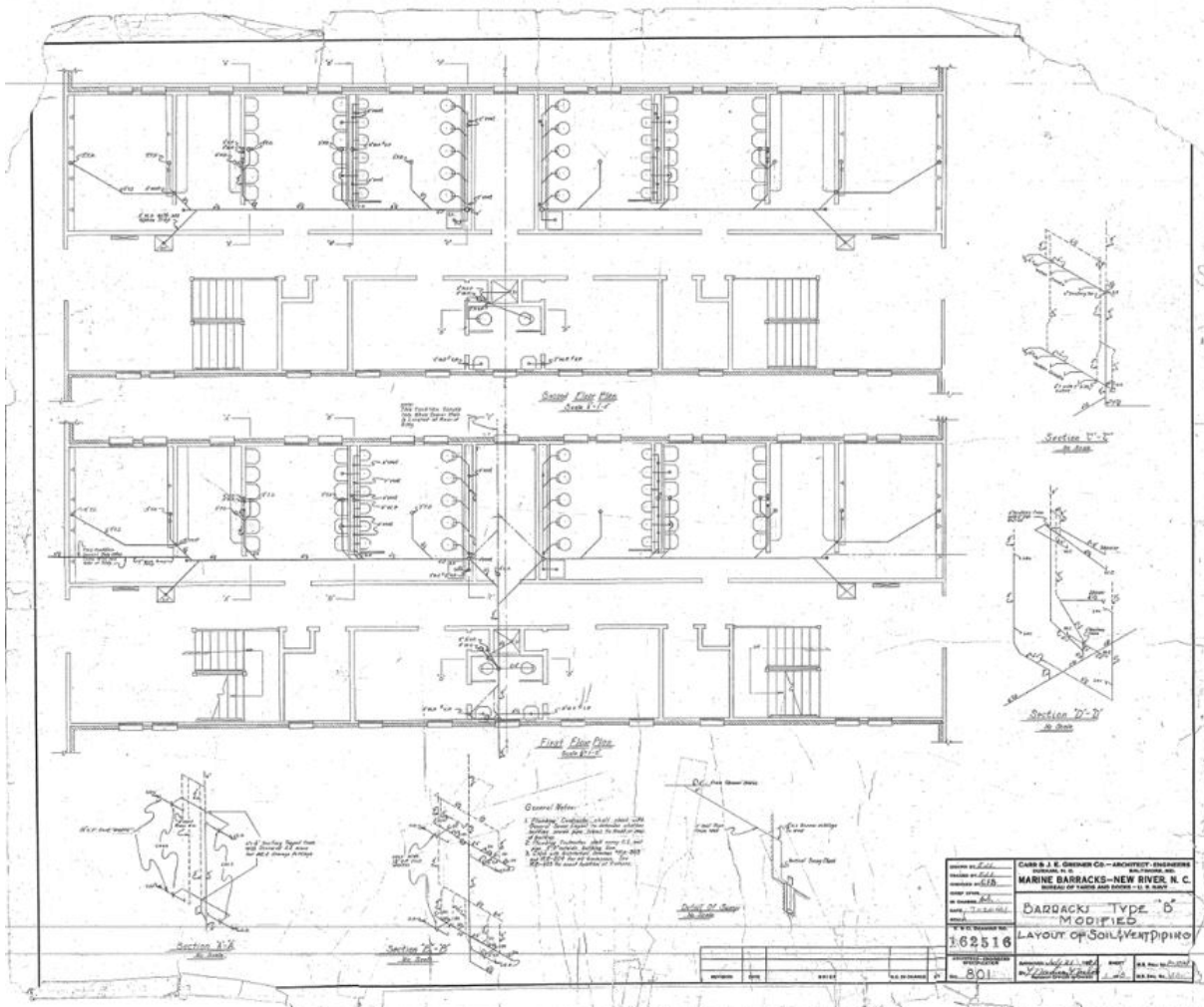
Inside of barracks at Mainside

Hundreds of thousands of Marines passed through the barracks over the course of the three decades under review. While some lived in the surrounding neighborhoods, such as Tarawa Terrace, Midway Point, or Camp Geiger, the majority of single Marines lived at Hadnot Point. The Hadnot Point single enlisted men's quarters, which hosted the largest group of people on base, per ATSDR drew its water supply from contaminated water in the area. A later report on water conservation at Lejeune prepared by a contractor for the U.S. Marines found that the average water consumption per day at Hadnot Point bachelor housing was 862,000 gallons (2.7 million a month). This report broke down the consumption by fixtures and, for example, used an estimate that toilets consumed 177,000 gallons per day. According to the report, shower flow rates were 4.5 gallons per minute, toilet flow rates were 4.5 gallons per flush, and faucet flow rates were 3.5 gallons per minute.⁴³

From the outside, these barracks resembled apartment complexes in urban areas of many cities, with interior arrangements similar to

spartan college dorms, lacking individual rooms until later. The young Marines lived in close proximity to each other, had communal bathrooms including showers, and shared adjacent mess halls where they ate together. There was little privacy at any point during the day for the Marines at Camp Lejeune, excepting some senior NCOs who had separate rooms. It was a very controlled environment that stressed conformity and regimented behavior conducive to preparation for the mission of combat.

⁴³ U.S. Marine Corps Headquarters, "Marine Corps Base Camp Lejeune and Marine Corps Air Station, New River: Water Conservation Analysis" (ECG. INC., 1999), 47, 60.



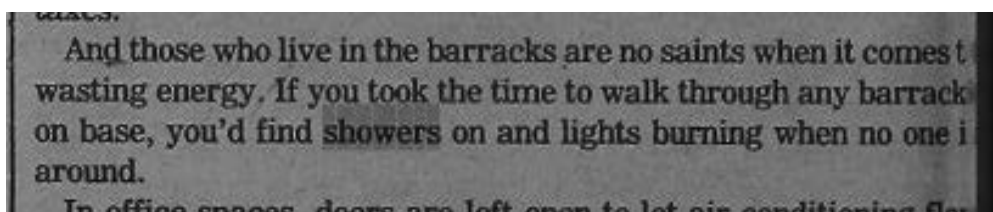
Structural drawing of barracks bathroom area with a gang shower with six shower heads

There were many ways that the Marines in the barracks had exposure to water. In the mornings, the Marines showered, brushed their teeth, shaved, and groomed themselves for the day, often many at a time in communal barracks bathrooms. Many of the bathrooms in the original base masterplan for Camp Lejeune had gang showers with six shower heads, like the one shown in the above schematic. These showers would run continuously in the mornings and evenings while approximately 58 Marines would shower and complete their personal hygiene routines in the steamy rooms.⁴⁴ Oftentimes during the summer, this could happen up to three times a day: mornings, evenings, and following heavy physical training.

⁴⁴ “Declaration of Allan Howard: *In re: Camp Lejeune Water Litigation*,” 26 November 2024, 11; “Declaration of Gary McElhiney: *In re: Camp Lejeune Water Litigation*,” 25 November 2024, 5.

The showers had other uses highlighted by Marines over the years. One heavy machine gunner operator remembered that keeping clean weapons was a “big, big deal in the Marine Corps.” In his case, he spent time in the showers taking care of the weapon, an M60 E2 machine gun. He recalled they would strip down to PT gear and flip flops, go in the showers, turn the water on as hot as they could endure, and then wash down 22-to-23-pound weapons. In the showers, they washed all the different components of their weapons, stripping them down before reassembling them, following the complete procedure of making them sparkle to pass inspection.⁴⁵ Another oral historian, former Master Sergeant Ensminger, says it was not the authorized method for cleaning weapons, but it happened a lot.⁴⁶

According to this Globe article, sometimes the showers in the barracks were even left on when no one was in them:



The Globe, 19 July 1979. Bates 00897 PLG 0000038193 to 00897 PLG 0000038204



Field Day, *The Globe*, 18 April 1945

This is significant because the Marines would sleep in the barracks all night, very close to where showers had just been running. Named Plaintiff Gary McElhiney, for example, remembers his sleeping quarters being about 30 feet from the showers at night.⁴⁷

The Marines would also clean their own barracks every day, with multiple hours of deep cleaning occurring once a week in what was known as “field day.” The Marines believed in instilling discipline in their ranks by keeping a clean barracks, especially their bunks, bathrooms, and showers. This meant at least once a week spending significant time sweeping, mopping, and disinfecting the entirety of their portion of the barracks, oftentimes on the weekends when they were off formalized training. They used large quantities of water, exposing their skin to it as well as encountering steam in the showers where they worked to prevent the

development of molds and mildews in vents and floors. Working without gloves or protective gear, they inhaled the steam that accumulated during the cleaning time. Even in the 21st Century, a

⁴⁵ Howard Deposition, p. 25.

⁴⁶ Oral historian statement, Ensminger.

⁴⁷ McElhiney Deposition, p. 73.

Marine noted: “Field Day plays a vital role in keeping Marines healthy and mission capable.”⁴⁸ It was also a source of significant use of water at least once a week.

The Marines would also wash their own laundry in machines in the barracks.⁴⁹ Mr. McElhiney and Allan Howard, another named Plaintiff who lived in the Hadnot Point barracks, both did their own laundry once a week in a laundry machine in their unit. Because 232 men lived in the type of barracks that Mr. McElhiney and Mr. Howard lived in, the laundry machinery could have been running for 232 cumulative hours a week in their barracks.⁵⁰ Mr. McElhiney’s recollection was that the laundry machines were “always very busy.”⁵¹



Marine Mess Hall at Hadnot Point
(Photo courtesy of U.S. Marine Archives, Quantico, VA)



Marines line up at the serving line,
The Globe, 4 Aug. 1988

VII. Mess Halls.

One of the places in Hadnot Point and the other barracks areas and neighborhoods where Marines experienced exposure to water was within the mess halls. They ate in the mess halls up to three times a day for breakfast, lunch, and dinner, where they drank tap water and coffee and tea made with local water, especially during the hot and humid months, and consumed meals prepared with local water. Drinking, eating, cleaning, and preparing food in the mess halls all contributed to ingestion, dermal absorption, and inhalation of water. The Marine Corps estimated that the mess halls utilized 116,000 gallons of water each day.⁵²

At meals, officers and NCOs pushed the young Marines to consume quantities of water, particularly on days when they had heavy physical training or long marches and runs. Additionally, for every meal, the Marines lined up to get their food at serving lines that were heated with steam, as can be seen in the photo at left from the *Globe* and in the schematics shown below, reflecting the installation of steam tables in a common dining facility layout.

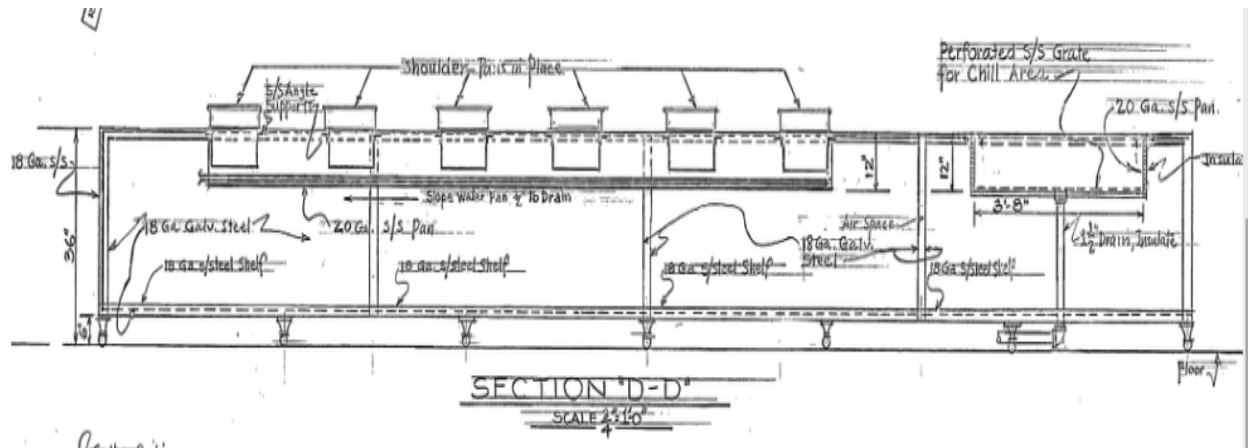
⁴⁸ U.S. Marine Corps, “Continuing the Field Day Tradition,” 22 March 2006, Marines: The Official Website of the United States Marine Corps, <https://www.lejeune.marines.mil/News/Article/Article/512046/continuing-the-field-day-tradition/>

⁴⁹ “Declaration of Gary McElhiney: *In re*: Camp Lejeune Water Litigation,” 25 November 2024, 12; Howard Deposition, 16 February 2024, p. 45, 48.

⁵⁰ Completion Report Covering the Design of Camp Lejeune U. S. Marine Barracks New River, North Carolina for the U.S. Navy Bureau of Yards and Docks Contract NOy 4751, p. 54, April 15, 1941-September 30, 1942. CLJA_USMCGEN_0000287341 to CLJA_USMCGEN_0000287705

⁵¹ “Declaration of Gary McElhiney: *In re*: Camp Lejeune Water Litigation,” 25 November 2024, 12.

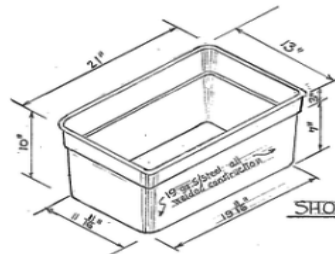
⁵² U.S. Marine Corps Headquarters, “Marine Corps Base Camp Lejeune and Marine Corps Air Station, New River: Water Conservation Analysis” (ECG. INC., 1999), 61.



Mess hall schematic drawing; steam table area

NOTE:

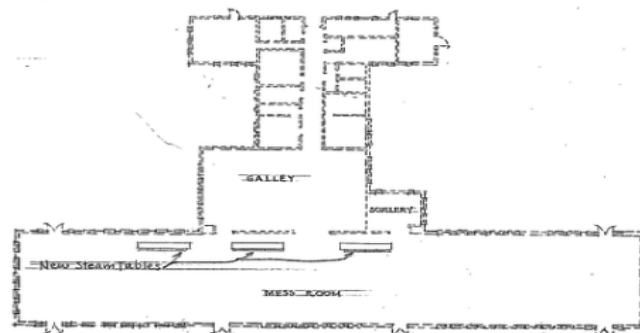
TWO STEAM TABLES (AS SHOWN) WITH CHILL AREA ON RIGHT HAND END REQUIRED FOR EACH MESS HALL.
ONE STEAM TABLE WITH CHILL AREA ON LEFT HAND END (OPPOSITE TO THAT SHOWN) REQUIRED FOR EACH MESS HALL.



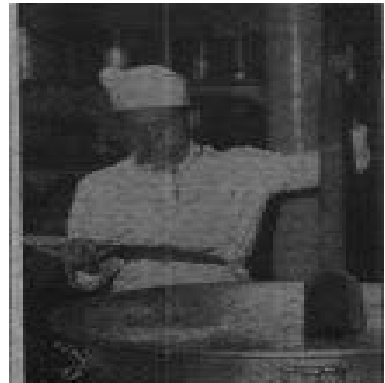
SHOULDER PAN & COVER

(not to scale)

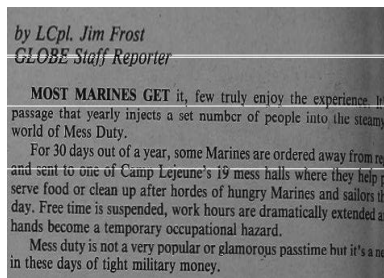
NOTE: Covers to be constructed to fit both pans and opening in Steam Tables.



Mess hall schematic drawing; steam table area



The “steamy world of mess duty,” *The Globe*, 24 June 1982



Reference to Lejeune’s “19 mess halls,” *The Globe*

Many of the Marines were required to work in the kitchens on mess duty, with tasks such as washing the dishes for numerous other Marines with hot, scalding water (and later big industrial strength dishwashers), drying, and then stacking dishes and all the pots and pans required, and mopping the floors. Mess duty lasted for 30 days, and Marines could serve three rounds of mess duty for a total of 90 days in a year.⁵³ They would work for about 14 hours a day in the “rigors of strenuous, tedious work.”⁵⁴ The *Globe* conducted an informal poll and found that 27 of the 30 Marines that the surveyors asked had participated in mess duty at least once.⁵⁵

One 1982 *Globe* article on mess duty described the “humid atmosphere of the scullery” and evoked that a “hot blast of air greets people who enter the scullery” where workers were “scraping plates and servicing the mammoth dishwashing machine.” The individuals washing the dishes were “hunched forward and covered with sweat generated from scrubbing pans in a steamy sink.”⁵⁶

The conditions were often very hot and wet. Steam filled the working areas and made life miserable. A 1985 report found that “existing mess hall facilities have a number of HVAC related problems. The scullery area is the most obvious. Working conditions in the scullery are impaired by the excessive heat and steam generated by the dish machine. We would recommend the installation of new make-up air ventilation equipment utilizing primarily outside air.”⁵⁷ A follow-up request to replace ventilation equipment dated September 16, 1985, stated, “Proper ventilation is not available in the galley, scullery, and serving lines. This lack of ventilation prohibits proper functioning of the air conditioning/heating units employed on food service workers and other mess personnel.”⁵⁸

⁵³ The *Globe*, Camp Lejeune, N.C., Vol. 28, No. 10, Mar. 9, 1972, Bates 00897_PLG_0000042688 to 00897_PLG_0000042699.

⁵⁴ The *Globe*, Camp Lejeune, N.C., Vol. 31, No. 5, Jan. 30, 1975, Bates 00897_PLG_0000040914 to 00897_PLG_0000040925.

⁵⁵ The *Globe*, Camp Lejeune, N.C., Vol. 43, No. 4, Jan. 29, 1987, Bates 00897_PLG_0000026597 to 00897_PLG_0000026636.

⁵⁶ *The Globe*, 24 June 1982.

⁵⁷ Wilber, Kendrick, Workman & Warren, Inc., “Fast Food Conceptual Study for Enlisted Dining Facilities: Marine Corps Base, Camp Lejeune, North Carolina,” 3 June 1985, 13.

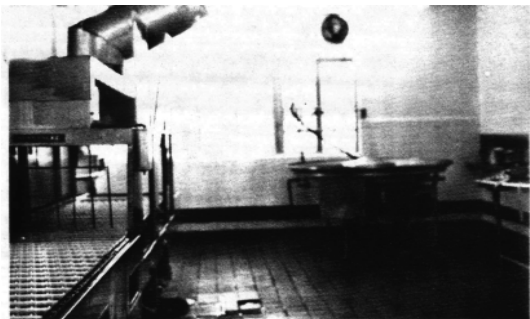
⁵⁸ Request for Replacement of Existing Hadnot Point Messing Facilities, Sep. 16, 1985, Bates CLJA WATERMODELING 07-0001081648 to CLJA WATERMODELING 07-0001081651.

I reviewed the testimony of two different Marines regarding their memories of mess duty. Gary McElhiney described his mess duty as being 30 days of ten-to-twelve-hour shifts scrubbing pots and pans in the scullery at the soak sink with no gloves or mask.⁵⁹ These many years later Mr. McElhiney recalled how “it was so hot” back in the scullery. He stood about five feet from the dishwasher, which would run starting at 6 a.m. He also brought hot water out in buckets to the serving lines, cleaned trash cans with hot water, and mopped the floors.⁶⁰



Cooking in Mess Hall, *The Globe*, 24 April 1952

Allan Howard, who served in the late 1970s, remembered being on mess duty for two 30-day stretches of lengthy shifts.⁶¹ Like Mr. McElhiney, he loaded the dishwasher and sprayed dishes at the sink using hot water and with no mask or gloves, the steam building up throughout the day. Mr. Howard also recalled the dishwasher running for the entirety of the day as the mess hall serviced numerous Marines for three meals. He described the physical exertion level as initially moderate but, because he sustained it over a long period of time, it increased. In this environment, Mr. Howard remembered the walls and floors as being wet because of the amount of moisture in the air in the kitchen. The steam, he recalled, would “almost take your breath away.”⁶²



Dish washing facility at Mess Hall 122

There is other evidence of the use of dishwashing machines and presence of steam and vapor in the mess hall environment. According to Charity Rychak Delaney, an environmental engineer at Camp Lejeune, some or all of the mess hall dishwashers lacked a vent hood until approximately 1986-87, in that “prior to the new equipment” being “installed around 1986/87[,] . . . steam could and would build up in the wash rooms.”⁶³ As evident in the historical picture to the left of a dishwasher station in Building 122, they were open below and drained to a hole in the floor in front of the machine.⁶⁴



Mess Hall Dishwashing Station

Additionally, steam would come from industrial-sized pots that Mr. McElhiney estimated would boil water from ten a.m. to eight or nine p.m. daily. Imagery from *The Globe* shows Marines working with these pots. All day long, but especially before the rushes for meals at breakfast, lunch, and dinner, the cooks and

⁵⁹ Video Deposition of Gary McElhiney, Sr., Knoxville, TN, 11 April 2024, p. 76-77 [hereafter McElhiney Deposition].

⁶⁰ “Declaration of Gary McElhiney: *In re*: Camp Lejeune Water Litigation,” 25 November 2024, 2-3.

⁶¹ “Declaration of Allan Howard: *In re*: Camp Lejeune Water Litigation,” 26 November 2024, 12.

⁶² “Declaration of Allan Howard: *In re*: Camp Lejeune Water Litigation,” 26 November 2024, 13.

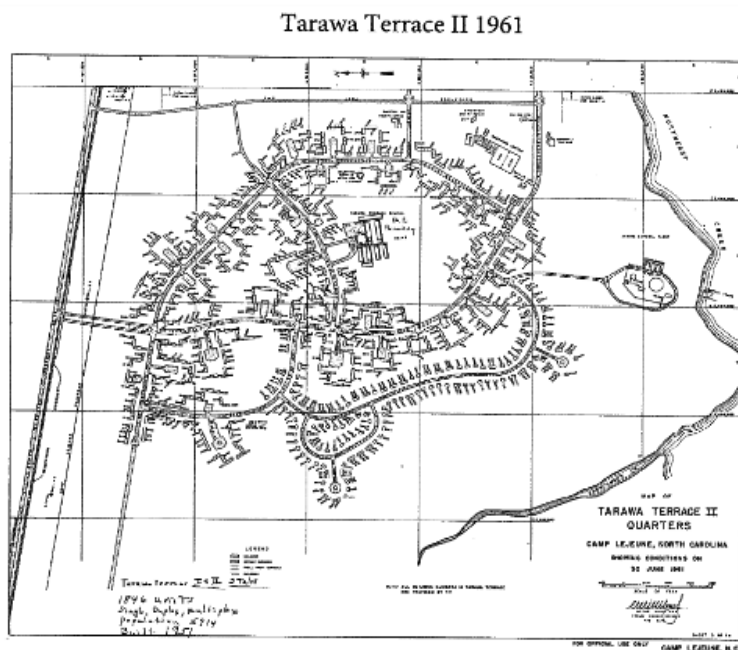
⁶³ Email from Charity Delaney to Jason Sautner (ATSDR), 24 July 2014, p. 1.

⁶⁴ Wilber, Kendrick, Workman & Warren, Inc., “Fast Food Conceptual Study for Enlisted Dining Facilities, 68.

their aides stirred and mixed large quantities of vegetables, pasta and rice, and other foods that required large quantities of water to prepare.

Whether exposed to the steam during the mess hall requirements or through drinking water during meals, the mess halls and other restaurants on base that provided meals to the soldiers relied on base-provided water.

VIII. Family Housing and Activities.



Master planned community of Tarawa Terrace II; note resemblance to suburban subdivisions across the country

Beyond the barracks for single Marines, many soldiers lived with their families in housing. These neighborhoods and communities included (as described by ATSDR and as relevant for purposes of the issues of contaminated water) Tarawa Terrace, Knox Trailer Park, Midway Park, Paradise Point, and Berkeley Manor. Like many rapidly developing suburbs across the country that sprouted during and after WWII, Camp Lejeune reflected the growth of master planned communities with centralized housing, playgrounds, cultural centers, and other facilities. At the same time, in the case of these neighborhoods that were part of the Marine base, the

occupants also still relied on the central system of Hadnot Point to provide many of the basic services that were also enjoyed by the single Marines stationed in their barracks at Hadnot Point.

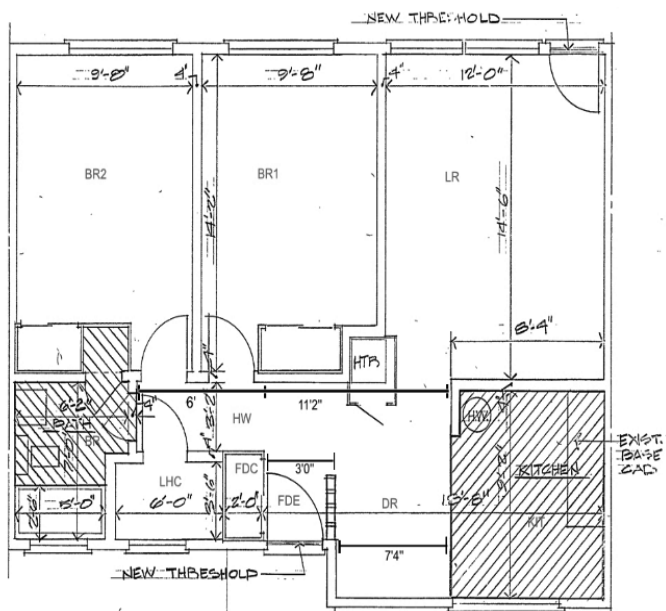
Many of these communities were hastily built during WWII as a master plan evolved around how to sustain the community vis-à-vis schools, health care, and workplaces. By the mid-1950s, there were over 400 one- and two-story homes for officers at Paradise Point, while Tarawa Terrace (#1 & #2) had over 2,100 one-, two- and three-bedroom homes for married officers and staff NCOs, and Midway Park had more than 1,100 one-, two- and three-bedroom homes. For many years, there were also many trailers for enlisted residents. Camp Knox held 450 of these trailers, and Camp Geiger had another 900.⁶⁵

⁶⁵ Jim Elliott, "Post of the Corps: Camp Lejeune," *Leatherneck*, 55:4 (April 1972): 24-25; Fugate, "Camp Lejeune," 22.

Within these homes, obviously, the families at Camp Lejeune would use water in all of the ways that constitute the necessities of life. They showered. They brushed their teeth. They shaved. They used the toilets. They bathed and showered their children. They drank from the tap, made beverages such as tea and coffee with that same water, cooked with it, and used it to clean.

Using Tarawa Terrace as an illustration, the Marine Corps estimated that each resident in this housing area used 63 gallons of water a day on average.⁶⁶ Tarawa Terrace resident Mrs. Jacqueline Tukes, there in the early 1980s, for example, toiled like many housewives of the time while her husband served. She made breakfasts of boiled breakfast sausages and grits made with the tap water available. For dinner, she often boiled her vegetables, rice, and meats in water. Once done, she handwashed the dishes along with the pots and pans in hot water that she ran for rinsing.⁶⁷

She recalled ingesting water throughout the day, cold water stored from the tap in the kitchen, especially on hot summer days. She used tap water to make beverages such as coffee, tea, and Kool-Aid or other powdered drinks.



**Schematic of a standard two-bedroom home
in Tarawa Terrace**

Ms. Tukes engaged in other chores such as mopping floors with hot water, wringing out the water and dumping it for cleaner water periodically. This was a chore as were others such as 20- to 30-minute spans cleaning the floors, toilets, and showers and bathtubs in the bathrooms, using water from the shower or faucets. She also did the laundry for herself, her husband, and her son, and ironed her own clothes and her husband's uniforms.⁶⁸

During the summer months, she would fill up a blow-up pool for her son with water from a hose outside her house at Tarawa Terrace as often as several times a week.⁶⁹

Mrs. Tukes lived in a home that looked like the schematic to the left with her husband, a Marine, and their toddler son, Antonio. The family shared one bathroom with no windows and rarely used the vent. Mrs. Tukes took hot showers for up to 15 minutes, up to twice

⁶⁶ U.S. Marine Corps Headquarters, "Marine Corps Base Camp Lejeune and Marine Corps Air Station, New River: Water Conservation Analysis" (ECG. INC., 1999), 43.

⁶⁷ Video Deposition of Jacqueline Tukes, Jacksonville, NC, 11 April 2024, p. 38-39, 49, 54-55, 107 [hereafter Tukes Deposition]; "Declaration of Jacqueline Tukes: In re: Camp Lejeune Water Litigation," 26 November 2024, 4.

⁶⁸ Ibid; "Declaration of Jacqueline Tukes: In re: Camp Lejeune Water Litigation," 26 November 2024, 4-5.

⁶⁹ Tukes Deposition, 40-41; "Declaration of Jacqueline Tukes: In re: Camp Lejeune Water Litigation," 26 November 2024, 7.



Three-bedroom unit. (Photo courtesy of U.S. Marine Archives, Quantico, VA)



Trailer Park unit (Photo courtesy of U.S. Marine Archives, Quantico, VA)



Kitchen in three-bedroom unit at Midway Park (Photo courtesy of U.S. Marine Archives, Quantico, VA)

a day, replacing one of the showers with a bath about twice a week. She also brushed her teeth daily with lukewarm water.⁷⁰

Mrs. Tukes would give her son a 15-minute hot shower before she showered. She recalled completing her personal hygiene and daily routine for 15-20 minutes in the bathroom while her husband was showering. She recalled that the door to the bathroom was closed during these showers.⁷¹

The accommodations in military housing varied depending on the quality of craftsmanship by the builder and when the military constructed them, but they had modern conveniences such as indoor plumbing, heat, sometimes air-conditioning (usually not central air as that came later in the 1980s and forward), electricity, and gas. These were all amenities that many Americans, especially through the 1950s and 1960s, still lacked, especially in impoverished regions where many of the enlisted oftentimes originated.

Outside of the individual homes in housing areas, the neighborhoods at Camp Lejeune were communities like many suburbs then sprouting up around the country. There were common areas, including playgrounds and sporting facilities, local PXs (the equivalent of the convenience store), theaters in many areas, and community centers where people gathered for many different events.

Mrs. Tukes and other women on base who were dependents of Marines had many duties outside of the home that took them all over the base. There was shopping to do at the Hadnot Point PX when they needed food and dry goods. There were school events, hospital appointments, and social engagements, mostly at Hadnot Point area where everyone congregated by taking the bus and walking around. Here, residents relied heavily on water fountains for hydration and consumed more in the hot/humid summer months.

⁷⁰ Ibid.

⁷¹ Tukes Deposition, 54-55.

When the kids were out of school, they swam at the local pools and did extracurricular activities across the base, typically relying on drinking fountains at the various facilities such as the Onslow Beach or sports fields.⁷² Parents could sign their children up for day camps where they could participate in games and play in the woods.

Numerous mothers such as Mrs. Tukes residing in on-base housing had similar daily routines with cooking, cleaning, laundry, and childcare, the latter shaped by the ages of the children and their school activities. Family members left their homes to visit with neighbors, travel to Hadnot Point for social events, engage in chores, shopping, and entertainment, and so forth. They interacted with the water at home and on main areas on base, much like their spouses, either traversing the huge base, or staying in Hadnot Point for training, administration, and other duties.



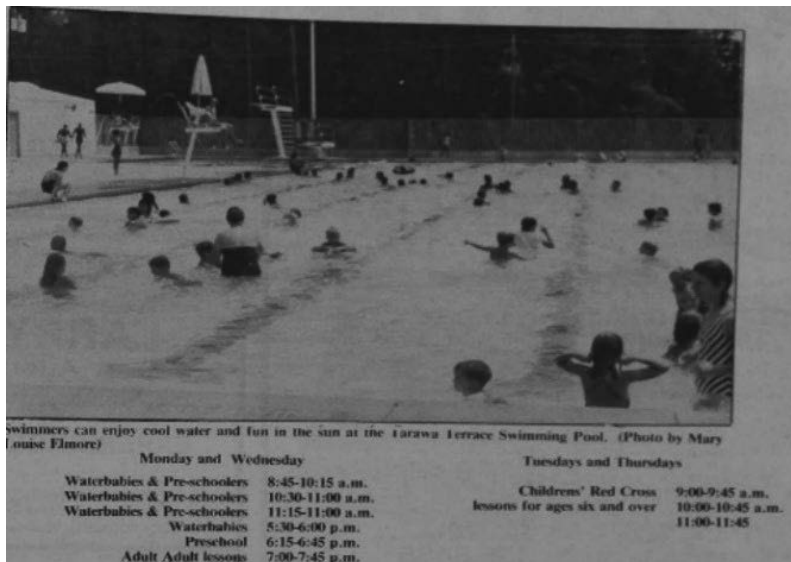
**Little League team, Lejeune,
The Globe, May 19, 1960**



**Children at playground,
Midway Park, The Globe,
May 19, 1960**



**Summer camp, The
Globe, Aug. 14, 1980**



swimmers can enjoy cool water and fun in the sun at the Tarawa Terrace Swimming Pool. (Photo by Mary Louise Elmore)

Monday and Wednesday		Tuesdays and Thursdays	
Waterbubies & Pre-schoolers	8:45-10:15 a.m.	Children's Red Cross	9:00-9:45 a.m.
Waterbubies & Pre-schoolers	10:30-11:00 a.m.	lessons for ages six and over	10:00-10:45 a.m.
Waterbubies & Pre-schoolers	11:15-11:00 a.m.		11:00-11:45
Waterbubies	5:30-6:00 p.m.		
Preschool	6:15-6:45 p.m.		
Adult Adult lessons	7:00-7:45 p.m.		

Family swimming at Tarawa Terrace pool



**Scuba training for children,
The Globe, 11 July 1963**

⁷² U.S. Marine Corps, "Recreation at Camp Lejeune, 1952," 23 June 1952, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina.



Water balloons, *The Globe*, 9 July 1981

The children also interacted with water throughout their days in the cafeterias and using water fountains throughout school properties on base. They drank tap water at home and at school. They spent hours at the baseball or football fields, bicycling or running around the base, and at the basketball and tennis courts. Children were active both during the school year and the summer.



Women at the Tarawa Terrace Beauty Shop, *The Globe*, 10 April 1986

While children attended school, there were a number of activities for mothers. As one person observed, "There are clubs to cover a wide variety of interest for women. There are enlisted, staff and officer wives' clubs, bowling leagues, golf associations, hobby-shop facilities, and a multitude of other activities."⁷³ Soldiers, their spouses, and their dependents went to school activities, volunteered on base, and attended clubs and other social activities, all the while spending their hard-earned and limited money on base (as the military intended). They developed relationships with fellow Marines and their families. It was a very insular system that resulted in individuals being often located on the base where the public water systems were.



Wives' Club of Knox Trailer Park, Dec. 1965, *The Globe*, 6 Jan. 1966

IX. Schools.

As in any community, schools were also a major organizing institution for children and families. Camp Lejeune had schools that started with pre-K and continued through elementary and high school, and additionally the base hosted university extension courses. Thousands of children populated the schools, which the Department of Defense staffed with civilian teachers employed through the Department of Defense Education Activity (DoDEA). By the late 1960s, there were seven elementary schools, and a large modern high school linked together by a good busing system that reached all parts of the base.⁷⁴ While the numbers fluctuated by the late 1970s, they held fairly steady at around 3,300 enrolled students, kindergarten through twelfth grade.⁷⁵ Like other schools across the country, those at Camp Lejeune hosted many activities for the kids as well as families. Students participated in sports such as football, basketball, swimming, baseball, and track.



Marine woman at hospital with wounded soldiers, *The Globe*, 6 Feb. 1970

⁷³ Richardson, "Post of the Corps," 28-29.

⁷⁴ Richardson, "Post of the Corps," 27.

⁷⁵ U.S. Marine Corps, Command Chronologies, July 1977-December 1977," U.S. Marine Corps Archive, Quantico, VA., 49.

Base School Bus Schedule
1966-1967

This is a detailed bus schedule for the 1966-1967 school year. It lists various locations including Courthouse Bay, U.S.N. Hospital, Paradise Point, Berkeley Manor, Midway Park, Tarawa Terrace I & II, Camp Knox, and Rifle Range. Each location has a corresponding bus route and schedule.

School bus schedule, *The Globe*, 25 Aug. 1966



Tarawa Terrace elementary, free dental exams, *The Globe*, 8 Feb. 1962

Lejeune High School — All 9-12 students residing in quarters at Camp Lejeune and New River Air Station.
Brewster Junior High School — All 7-8 students residing in quarters at Camp Lejeune and New River Air Station.
Delallo Elementary School — All K-6 students residing in quarters at New River Air Station.
Tarawa Terrace I Elementary School — All K-3 students residing in quarters at Tarawa Terrace, Camp Knox and Midway Park.
Tarawa Terrace II Elementary School — All grade 4 students residing in quarters at Tarawa Terrace, Camp Knox and Midway Park. All 5-6 students residing in quarters at Tarawa Terrace, Berkeley Manor, Paradise Point, Hospital Point, Courthouse Bay, Rifle Range, Camp Knox and Midway Park.
Berkeley Manor Elementary School — All K-4 students residing in quarters at Berkeley Manor and on Oklahoma and Ohio Courts at Watkins Village.
Stone Street Elementary School — All K-4 students residing in quarters at Paradise Point, Hospital Point, Courthouse Bay, Rifle Range, and Watkins Village except quarters on Oklahoma and Ohio Courts.
The 1960-61 school year will begin 2 September 1960.
Eligibility. All dependent children who are living with their military sponsor in government quarters and are of school age are eligible to attend the school system.
Children of personnel who are certified by the Base Housing Officer

School information, from *The Globe*, 10 July 1980



Tarawa Terrace II Track Meet, *The Globe*, 8 Feb. 1962

Like their parents who trained in the often hot and humid environment, they consumed water to battle dehydration (both during breaks at the water fountain between classes and after recess as well as at lunch). In junior and high school, they also often participated in sports that would have led to showering following participation.

School would have been the source of a school-going child's or teenager's water for the majority of their day whether they were drinking it from the taps between classes, ingesting it with their cafeteria food, inhaling steam in the showers, or quenching their thirst after running around in the sports and activities offered after regular school hours had elapsed.

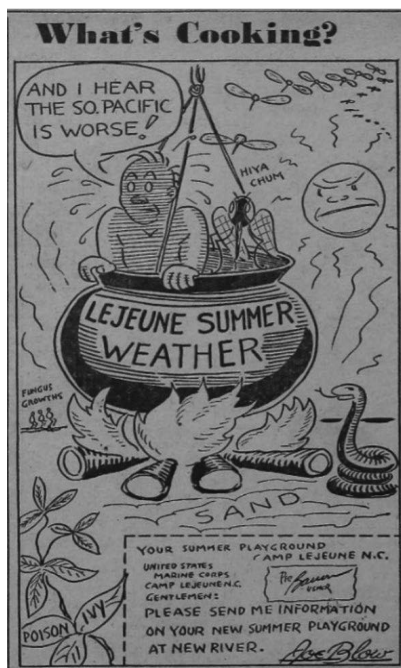
X. Climate.

The weather of the period from the late spring until the early fall approximated some tropical climates, which the lack of air conditioning exacerbated before its large-scale introduction in the 1960s and 1970s. The base was located on the coast, in the south, and as noted above, numerous activities occurred outdoors.

Historically preserved anecdotes and reporting reflect how Camp Lejeune was known to many as “Swamp Lejeune” or “Swamp Lagoon,” due to its marshy coastal setting complete with swarms of mosquitos.

One Marine who fought along the New River at the Battle of Guadalcanal in horrific conditions of the tropical South Pacific in 1942 commented about Camp Lejeune: “If this place had more snakes, it would be just like New River.”⁷⁶ A *Globe* cartoon alluded to the climate:

⁷⁶ Mike Magner, *A Trust Betrayed: The Untold Story of Camp Lejeune and the Poisoning of Generations of Marines and Their Families* (DeCapo Press, 2014), 30.



The Globe, 1944

As the cartoon to the left and the table below indicates, Camp Lejeune’s location near the water, both the beach and tidal rivers, led to higher temperatures during the summer months with large quantities of sunlight. The nature of Camp Lejeune’s weather naturally was coupled with a need to stay hydrated.⁷⁷ During hot days, family members would run errands, attend to foodstuffs and other needs, go to scheduled medical appointments and physical activities throughout the day, and so forth.

It was a challenging setting for heavy exertion and exercise as compared to the other Marine base at Camp Pendleton in California, which in July was, on average, 15 degrees cooler with nice ocean breezes and lower humidity. The climate affected how much water the Marines and their dependents needed, and the U.S. military would have been hard-pressed to find a place with warmer sunnier weather to train and house large numbers of Marines outside of bases such as those overseas in the Philippines, Panama, or Cuba.

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average High (F)	56	59	66	74	81	87	90	88	83	75	67	58
Average Low	34	37	43	51	59	68	72	71	65	54	44	37
Average Humidity	73%	74%	72%	72%	75%	75%	75%	76%	76%	74%	74%	73%
UV Index	2	3	4	5	5	6	6	6	5	4	3	3
Rainfall (in inches)	4.06	3.63	4.10	2.74	3.70	5.07	7.11	7.19	6.90	4.0	3.74	3.44

Table reflecting historical climate readings, Camp Lejeune area⁷⁸

XI. Staying Hydrated.

The military has focused on the health of its soldiers over its long history. It has been a priority for commanders to sustain operational units, including through a focus on the basics of hydration. As one military study under the heading “Message to the Unit Commander,” stressed, “historically, in every conflict the US has been involved in, only 20% of the hospitalizations have been from combat injuries. The other 80% have been from diseases and nonbattle injuries (DNBI).” It added: “Excluded from these figures are vast numbers of soldiers with decreased combat effectiveness

⁷⁷ See The Camp Lejeune Globe, Camp Lejeune, N.C., Vol. 2, No. 9, April 18, 1945. Bates 00897_PLG_0000056445 to 56460.

⁷⁸ U.S. Climate Data, “Climate Camp Lejeune-North Carolina,” <https://www.usclimatedata.com/climate/camp-lejeune/north-carolina/united-states/usnc1306> [accessed 23 November 2024]; Weather World, “Camp Lejeune, North Carolina Climate Averages,” <https://www.weatherworld.com/climate-averages/nc/camp+lejeune.html> [accessed 23 November 2024].

due to DNBI not serious enough for hospital admission.” It concluded: “Preventive medicine measures are simple, commonsense actions that any soldier can perform, and every leader must know.”⁷⁹ Preventative measures included hydration such as during significant physical exertion. As General Anthony Zinni has noted, “It is considered a leadership responsibility . . . especially in climates like [Camp Lejeune], to ensure that [Marines] are hydrated. We have—our medical people, our corpsmen, in our units . . . where we have doctors’ part of their responsibility, too, is to ensure that people are properly hydrating.”⁸⁰



Marines in full gear march

The majority of training for the Marines at Camp Lejeune, depending on their MOS,⁸¹ revolved around preparing for the next deployment. This meant a great deal of time focused on physical preparedness and readiness. As one Vietnam-era Marine noted: “They work us harder than the average college student. But there’s a reason. We are learning how to kill, while the college student is learning how to live.”⁸² It was serious business; throughout Camp Lejeune’s existence in WWII and the Cold War, Marines never knew what to expect in terms of their next mission, as hotspots developed periodically such as in Korea, Lebanon in 1958, Vietnam, Lebanon and Grenada in 1983,

and the Middle East after 1991. These tasks mandated combat readiness. One Marine noted about the focus at Camp Geiger after leaving Parris Island: “He must be in top physical shape and stay that way throughout his tour.”⁸³ A Marine manual emphasized something similar: “A program of regular, vigorous and progressive physical training results in an increase in work efficiency, self-confidence, and personal as well as unit pride.” The manual argued that cardiovascular training, with a focus on stamina for “prolonged activity of a moderate tempo,” combined with strength work to manipulate, at the minimum, the weight of the individual ensured longer lives and the “ability to march long distances with heavy loads or to work long hours and still maintain the reserve to carry on in an emergency.”⁸⁴

The daily routine for most Marines on base required physical training, often Monday through Saturday. The day often started early, sometimes around 6 a.m. After being allotted time to dress and go to the bathroom, Marines headed out of the barracks for calisthenics and training. They often performed hours of resistance exercises with their body weight, including push-ups, sit-ups, squats, and other innovative exercises the trainers directed them to complete to build lean muscle. They engaged in such exercises as using rifles for lunges, completing chest presses, and participating in static exercise, which resulted in aerobic and anaerobic exertion. At times, six-to-

⁷⁹ Department of the Army Headquarters, *Field Hygiene and Sanitation* (Department of the Army, 1988), 1.

⁸⁰ Zinni Deposition, 41-42.

⁸¹ The Marines Military Occupational Specialty (MOS) is a system that categorizes career fields.

⁸² As cited in Kyle Longley, *The Morenci Marines: A Tale of Small Town America and the Vietnam War* (University of Kansas Press, 2013), 76.

⁸³ Jack McLean, *Loon: A Marine Story* (Ballantine Books, 2009), 58.

⁸⁴ U.S. Marine Corps, “United States Marine Guidebook of Essential Subjects,” (U.S. Marine Corps Institute, 1983), 7.1-7.2.

Table 1. Water Requirements

Activity	Illustrative Duties	Quarts per man per day for drinking purposes (a guide for planning only) WBGT or WD Index*	
		Less than 80°	Greater than 80°
Light	Desk work	5	6
Moderate	Route march	7	9
Heavy	Forced marches; stevedoring; entrenching; or route marches with heavy loads or in CBR protective clothing.	9	13

* 80° WBGT or WD index is approximately equivalent to a dry bulb temperature of 85° in a jungle or 105° in a desert environment. (WD = $0.85WB + 0.15DB$)

seven-mile runs followed as well as days at the obstacle courses where they climbed ropes, crossed monkey bars, crawled under barbed wire, and ran through a variety of obstacles. All the while, instructors pushed them to attain and stay in top-notch shape and to create unit cohesion. Depending on the schedule, these instructors might order the Marines into their camouflage gear with full packs that weighed between 50-60 pounds in addition to their weapons before embarking on marches that could go as long as 50 miles.⁸⁵



Marines in MOPP Gear

As seen in the “water requirements” table above-left found in a 1980 publication put out by the U.S. Navy, Army, and Air Force, all of these activities, coupled with the climate, necessitated consumption of water that contrasted with ordinary consumption of individuals in other less rigorous forms of service.⁴ The weather and duty types led to the Marines taking steps to provide easily accessible drinking water. The Marines worked hard to develop means to ensure the availability of this water so as to avoid dehydration and issues such as cramps and heat stroke.⁸⁶



Marines in MOPP Gear, *The Globe*, 16 Aug. 1984

During training, the Marines often carried their 32-ounce canteens (often more than one) which they filled periodically in the barracks or from water barrels with hoses across the base. While, in the 1970s, the Marines began allowing supplemental additions such as Gatorade for mineral replenishment, mostly, instructors were just directing the Marines to drink water during their breaks.

Training was more severe when the Marines had to conduct operations in MOPP (Mission Oriented Protective Posture) with heavy body suits and masks to protect against chemical, biological, or radiological threats. Heavier body armor was worn in combat training exercises that had become a standard during the Vietnam

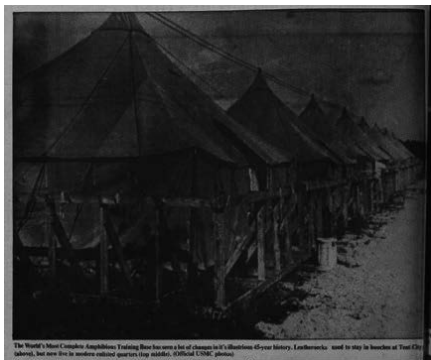
⁸⁵ U.S. Marine Corps, “Obstacle Course at Camp Lejeune, 1953,” 14 May 1953, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina; U.S. Marine Corps, “Training Activities at Camp Lejeune,” 31 October 1961, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina; Oral History via Zoom by the Author with Alan Howard, 30 August 2024 [hereafter Howard Oral History].

⁸⁶ Departments of Army, Navy, and Air Force, “Prevention, Treatment and Control of Heat Injury” (Washington D.C. Departments of the Army, the Navy, and the Air Force, 1980), 5.

War and evolved in 1980s. Manuals emphasized that “MOPP/body armor increases your heat stress” and to “drink more water. Work and rest as your leader directs.”⁸⁷ The Marines had incorporated the gear when training for deployment to hotspots in the Middle East where governments had chemical/biological weapons. The training on base, whether physical training or preparing for biological and chemical warfare, was intense.

The Marines were readying themselves for future deployments, oftentimes not knowing where they might go. However, they knew it could be an inhospitable climate that required preparation for everything from providing water to cooking and showering in the middle of a combat zone. Thus, the Marines took time away from the main part of the base and training areas and headed out into the field for simulated campaigns that would prepare them for the situations that they would face.

XII. Field Training and Tent Cities.



Field tents for bathing and dressing,
The Globe, 8 May 1986

Historical records describe that approximately twenty percent of the time spent by Marines at Camp Lejeune could involve field training, spending a week or so at various parts of the base (and sometimes at places such as Fort Bragg) preparing for maneuvers and trying to replicate the nature of combat or amphibious assaults, at least living conditions during deployment.⁸⁸

One of the challenges that the military faced in the wars in the 20th Century, particularly those fought by the Marines in South Pacific and later Vietnam, was how to deal with the heat and humidity. Many of the areas where the troops prepared to fight in Southeast Asia, Latin America, Africa, and the Middle East

required preparation for extreme climates with many challenges. These environments generally required large quantities of water for sanitation and proper hydration to sustain troops in combat and prevent both diseases, such as dysentery, and also heat related ailments, such as heat stroke. Thus, the Marines and other military branches emphasized how to care for their soldiers relating to water during field training, especially in hotter climates such as those of Camp Lejeune. Marines at Camp Lejeune recall these long days preparing for future deployments. Mr. McElhiney remembers that, during a six-month training period, he spent ten days a month living in the field. Outside of that six-month training period, he spent another two weeks every three- or four-months doing field training. Similarly, Mr. Howard recalls spending ten, or maybe slightly more, days in the field in a 30-day month.⁸⁹

⁸⁷ Department of Army Headquarters, *Field Hygiene and Sanitation*, 6.

⁸⁸ U.S. Marine Corps, “Maneuvers at Camp Lejeune,” 16 July 1969, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina.

⁸⁹ McElhiney Declaration, 3; Howard Deposition, 17.



Marines fill water buffalo, Hadnot Point



Marine showering in the field, *The Globe*,
26 June 1952

According to General Anthony Zinni, during the Vietnam War era, Marines went out on maneuvers for weeks at a time. To hydrate, they used water buffaloes, wheeled water tanks that provided water during field training and operations. The logistics command was the fourth service support group located at Hadnot Point, the industrial area, and they had responsibility for providing this water.⁹⁰

On field days, many Marines used water buffaloes for hydration, brushing teeth, shaving, cooking, cleaning and "field bathing." Sometimes they would mix water buffalo water with "meals ready to eat" or food that they needed to hydrate to consume.⁹¹ Some of the Marines would even stay in "tent cities" to house, feed, and clean themselves during field days in order to simulate deployment conditions. One retired Marine, Lamar Urquhart, recalled the tent cities during his deposition. An electrician, he helped set up these tent cities at Camp Lejeune in the early and mid-1980s. He helped wire up the water heaters that used water provided by water buffaloes to provide hot water to the shower tents. He also helped prepare for field deployment by filling the water buffaloes primarily at Hadnot Point locations.⁹² There were also "GP" (general purpose) tents sized about 20 by 20 feet. They connected three of these GP tents for bathing. One would be a shower tent, with multiple shower heads, often all running together simultaneously, creating a "steam bath," former service member Mr. Urquhart recalled. The water was hot and the ceiling at the shower heads stood at about 7-8 feet. Mr.

Urquhart said you could touch it by reaching up when under the shower head. The ventilation was poor because the ventilation flaps at the top of the tent were typically closed, especially during cooler weather. The next two tents would be for changing clothes and brushing teeth, with sinks pulling from the same water buffalo or tap water. Mr. Urquhart also described the "mess" tents, where the marines would eat. These tents paralleled the bathroom tent setup with water pulled from the water buffaloes for drinking and preparing beverages including coffee, or for cooking meals.⁹³

⁹⁰ Video Deposition of General Anthony Charles Zinni, Williamsburg, VA, 28 May 2024, 33-34 [hereafter Zinni Deposition]. See also *The Globe*, 18 June 1981; *The Globe*, 15 October 1987.

⁹¹ Howard Deposition, 34-36; McElhiney Deposition, 70-71.

⁹² Video Deposition of Benjamin L. Urquhart, 13 November 2024, 72 [hereafter Urquhart Deposition]

⁹³ Urquhart Deposition, 84-89.

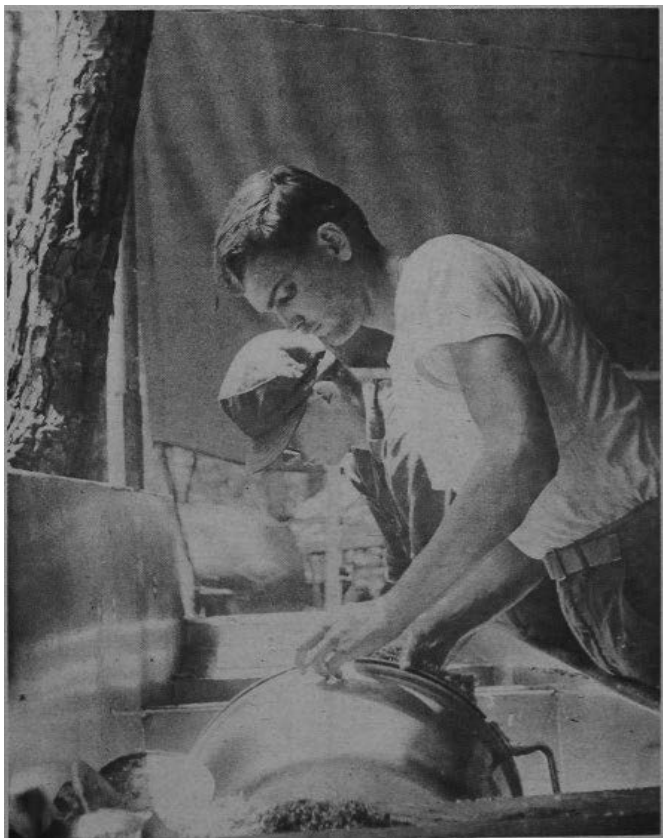
106. INDIVIDUAL WASHING. When necessary, soldiers in the field must wash and retain their own mess kits. Just before each meal the mess kits are disinfected as described in a below. After the meal, remaining food is scraped off as completely as possible into a garbage can or pit, using the spoon. The washing, rinsing, and disinfection after use is done in a series of three containers (usually GI cans) by the method described in b below:

a. Disinfection before use. Before each meal, the mess gear with the exception of the canteen will be disinfected by immersing for not less than 3 seconds in clear boiling water. All of this equipment including cutlery may be assembled by hanging it on the meat can. Wire hooks or other suitable holders may be improvised to avoid too close contact with the steam.

b. Washing, rinsing and disinfection after use.
(1) Wash thoroughly in first container, filled with *hot soapy water* (120° F. to 140° F.) or other approved

99

A field training manual from July 1945 outlines proper care of mess kits



Marines washing pots in the field, *The Globe*, 18 July 1974

By the 1980s, the military had established hydration guidelines for field training exercises based on lessons learned from earlier wars which later served important roles in the wars of the desert in 1991 and in Iraq in 2003. Among the military's recommendations was one stating that, "Depending on the heat, you may need to drink from ½ to 2 quarts of water per hour—4 gallons or more per day in hot dry climates." These guidelines promoted drinking water before beginning exertion, preferably cool water (50 to 55F), drinking small quantities frequently even when not thirsty, and filling and topping-off canteens when provided an opportunity.⁶⁶

The training in the field was more intense for those at Camp Lejeune preparing for Recon. Often considered the most elite units in the Corps, groups of five to seven men could be dispatched, often behind enemy lines, to reconnoiter enemy positions and request air strikes and artillery on an elusive enemy. Their physical training, with rigorous assessments of strength and endurance training, included daily swimming and often water survival, time on the rifle ranges, special training with weapons, and testing on tactics and first aid. The initial training period typically washed out over fifty percent of those who began the program. More than any group on base, they spent time in the field and training, experiencing challenges including heat exhaustion and cramping.

Additionally, each summer, more than 10,000-15,000 reservists invaded the base for their Annual Training Duty (ATD), swelling the ranks of the thousand-man naval personnel working in the hospital and

Medical Field Research Laboratory that combined with nearly 3,600 civilian employees and twenty thousand or more military dependents. During this time, water for showers, cooking and cleaning, and of course consumption increased significantly and placed a heavier burden on the water wells and the water distribution system.⁹⁴

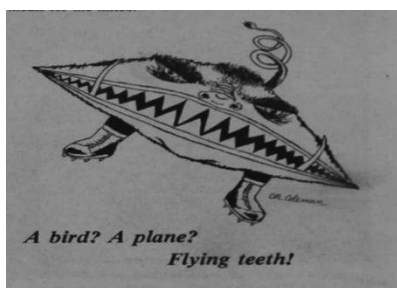
XIII. Compromising the Skin Barrier on Field Days.



Passing through barbed wire



Medic treating Marine with foot blisters, *The Globe*, 1961



Chigger in *The Globe*, 2 July 1981

One of the challenges of field training had to do with abrasions and wounds incurred during the process. A major focus of the Marines and Army was footwear and having properly fitting boots and dry socks when fighting or training in wet areas. Wet footwear combined with long marches, sometimes exceeding twenty miles a day, led to Marines often ending up with blisters on their feet and ankles. In the field there was water available for washing skin drawn from sources at Hadnot Point and carried into the field in water buffaloes.⁹⁵

Other wounds experienced in the field included from barbed wire and other obstructions or through bites of insects such as mosquitoes, chiggers, ticks, and fleas from the marshes and forests, creating lesions (often made worse by scratching at the bites) that required treatment to prevent infection.

Chiggers existed in large numbers and plagued Marines, along with mosquitoes. *The Globe* published twenty-five different articles from the 1950s through the 1980s mentioning chiggers. These pests bore into skin and inject a toxic ingredient that leaves red welts. People can scratch at them until they bleed. The Marines tried everything from wearing panty hoses to flea collars, and heavy concentrations of insect repellent, often with no effect. They were everywhere, in the high grasses, along hiking trails, and even the golf course and front lawns.⁹⁶ The advice that *The Globe* published on getting rid of these insects involved applying water directly onto the chigger burrows in the skin. The articles noted that “the most immediate way to reduce the itching is to take repeated baths,” and “[o]nce chiggers have bitten, the experts advise using a hot washcloth applied to the area affected.”⁹⁷

⁹⁴ Elliott, “Post of the Corps,” 19; U.S. Marine Corps, “Reserves Training at Camp Lejeune,” 1949, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina.

⁹⁵ U.S. Marine Corps, “First Aid at Camp Lejeune,” 1972, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina.

⁹⁶ *The Globe*, 1 July 1981; *The Globe*, 9 June 1977, *The Globe*, 3 May 1957.

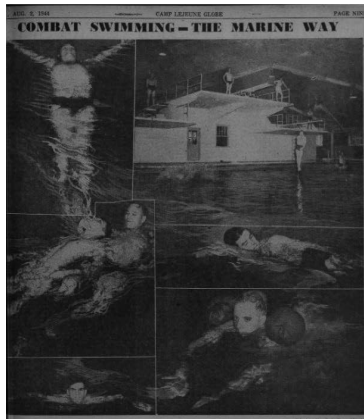
⁹⁷ *The Globe*, 5 May 1983.

Field training was a hard and dirty duty during which Marines often slept on the ground, which was often muddy during the rainy season of the summer, when as much as 7-8 inches of rain fell a month. Field training constituted a major part of the training experience and involved use of water from Hadnot Point for drinking, bathing, washing hands, brushing teeth, and other activities.

XIV. Swimming Pools.

Marines and their family members also frequently used the indoor pools for training and recreation. Contributing to the potential pervasiveness of water moisture within these spaces, a 1986 survey found that the Area 2 and Area 5 Training Pools in Hadnot Point both had exhaust fans that were not operational.⁹⁸

Because they were part of the U.S. Navy and needed the skills to survive at sea and during amphibious assaults, Marines had to spend time doing water survival training. In large indoor training facilities across base, everyone learned to swim effectively and many more went beyond the requirements to become instructors. Every Marine had to have some form of swim training and pass a series of tests annually to continue to receive certification. According to a 1944 issue of *The Globe* publication, during the “beginner” stage of training, soldiers spent five hours in the pool, and the “rough water” stage of training included four hours in the pool. Those who had not learned to swim in advance needed instruction in treading water, simple swim strokes, and other water safety. Annually, the Marines retested people as recalled by Mr. Howard among others.⁹⁹



The Globe, 2 Aug. 1944

Marines who participated in a pre-dive course could spend hours in the pool each day for two weeks. It could take two hours for a Marine to become basic swim qualified, four to five hours for a Marine to become intermediate swim qualified, and 25 hours for a Marine to become advanced qualified. Some Marines also became water safety survival instructors who spent time learning to teach others to swim that they learned to float for 10 minutes and swim 50 meters while diving to the bottom of the pool to retrieve objects, all the while with their feet tied together.¹⁰⁰

⁹⁸ J. R. Bailey, Commander, Atlantic Division, Naval Facilities Engineering Command, Transmittal of Survey of Potable Water Treatment Plants and Swimming Pool Water Treatment, p. 5, Dated May 29, 1986, Bates CLJA_USMCGEN_0000006660 to CLJA_USMCGEN_0000006671.

⁹⁹ *The Globe*, 2 August 1944; Howard Deposition, 45-46.

¹⁰⁰ Email from Charity Delaney to Jason Saunter, 20 August 2014. The Marines follow a similar curriculum even today. Ashley Gomez, “Camp Lejeune Marines Sharpen Water Survival Skills,” *Marines: The Official Website of the United States Marine Corps*, 18 July 2018, <https://www.lejeune.marines.mil/News/Article/Article/1572942/camp-lejeune-marines-sharpen-water-survival-skills/> [accessed 30 November 2024]



1962 *Globe*. 00897 PLG 0000048152-
00897 PLG 0000048163.

The Marines had significant interaction with the swimming pools on base, often at Hadnot Point. Many trained hours in the water, including those in specialized training such as Recon, absorbing it through full body immersion. It was one of the many ways by which people at the base interacted with water, but an important one given the requirements and the opportunities. The pools were also open to the civilian population and Marines to use recreationally. This recreational time at the pool included independent swimming as well as group classes. Mr. McElhiney, for example, taught scuba lessons for four-hour-long stretches at the pool on certain weekends.¹⁰¹ There are also historically preserved videos of residents taking their small children for swimming classes on base, including a specialized “Water Babies” course for infants.



Water Babies course (video still)



Swim Team Practice, 1979.
00897 PLG 0000038011-
00897 PLG 0000038024

There was also a swim team for residents aged six to eighteen that practiced 4:30 to 6:30 p.m. Monday through Friday in the Area 5 swimming pool and sometimes hosted meets on Saturdays.¹⁰²

¹⁰¹ “Declaration of Gary McElhiney: *In re: Camp Lejeune Water Litigation*,” 25 November 2024, 29.

¹⁰² The *Globe*, Camp Lejeune, N.C., Vol. 35, No. 43, Nov. 1, 1979, Bates 00897_PLG_0000038011 to 00897_PLG_0000038024; The *Globe*, Camp Lejeune, N.C., Vol. 29, No. 17, Nov. 21, 1973, Bates 00897_PLG_0000041602 to 00897_PLG_0000041609; The *Globe*, Camp Lejeune, N.C., Vol. 43, No. 4, Jan. 29, 1987, Bates 00897_PLG_0000026597 to 00897_PLG_000002663; The *Globe*, Camp Lejeune, N.C., Vol. 28, No. 17, Apr. 27, 1972, Bates 00897_PLG_0000042620 to 00897_PLG_0000042631; The *Globe*, Camp Lejeune, N.C., Vol. 21, No. 22, June 3, 1965, Bates 00897_PLG_0000046163 to 00897_PLG_0000046174.



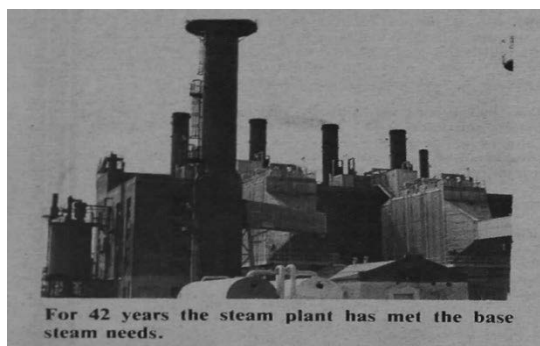
Swim Team Competition at the Area 5 Pool, 1972.
00897 PLG 0000042620-00897 PLG 0000042631.



Scuba training at indoor pool, from *The Globe*

XV. Steam.

Steam was not only associated with hot water use activities like cooking and showering, but also in connection with other uses. Hadnot Point's central heating plant relied on steam with a 9,000-square-foot boiler with an operating pressure of 150 pounds according to a record from 1946.¹⁰³ By 1972, the Hadnot Point heating plant capacity had significantly increased. That year, the plant had four different boilers with capacity for 100,000 pounds per hour each. When temperatures were low, the plant used up to all four boilers in service to meet base demand, around 335,000 pounds per hour. A 1972 document stated that they would need to add a fifth boiler with a 100,000 pound per hour capacity in order to meet base demand for heat generation.¹⁰⁴



Steam plant, *The Globe*, 16 Aug. 1984

According to a document from 1985 listing the duties and responsibilities of the deputy maintenance officer, "[a]nnual steam production [was] approximately 1.5 billion pounds" at the hot water plants across Camp Lejeune.¹⁰⁵ In 1984, *The Globe* ran an article stating that seven steam plants across the base produced a cumulative 1,800,000 pounds of steam per hour in the summer months and a cumulative 4,500,000 pounds of steam per hour in the winter months. According to

¹⁰³ Camp Lejeune, U.S. Marine Base and Related Activities: U.S. Naval Hospital, U.S. Coast Guard Detachment, Field Medical Research Laboratory, Dog Detachment, and Marine Training Command, dated Oct. 1, 1946, Bates CLJA_WATERMODELING_07-0001200597 to CLJA_WATERMODELING_07-0001200638.

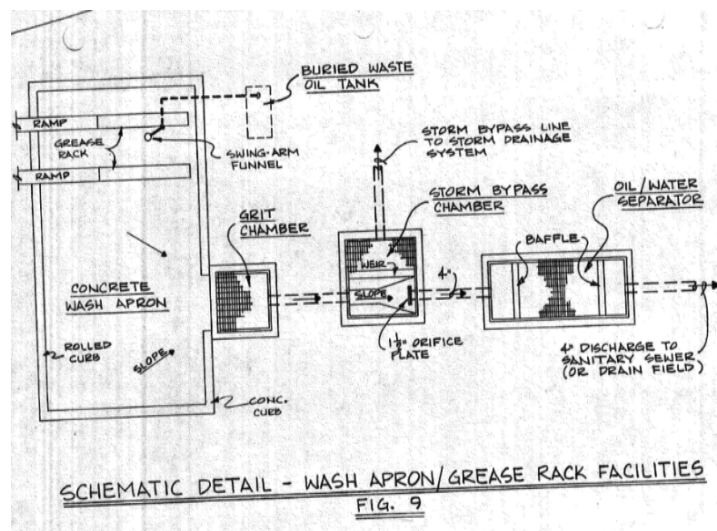
¹⁰⁴ U.S. Marine Corps, "Marine Barracks Camp Lejeune, North Carolina, Naval District Five Report," 1 October 1946 [CLJA_Watermodeling_07-0001200597]; U.S. Marine Corps, "Master Plan for the Development and Utilization of the Camp Lejeune Area," 24 March 1970 [CLJ0257940].

¹⁰⁵ U.S. Marine Corps, "Position Description for Director, Maintenance & Repair Branch," 16 December 1987. [CLJA Watermodeling, 07-0011086866, 07-0001086909].

the article, “[t]he steam is derived from water obtained from the water treatment plant.”¹⁰⁶

Marines, their family members, and other civilians worked in laundry facilities, fire stations, hair salons, dentists, hospitals, bakeries, and meat preparation facilities. At each of these places, people could encounter steam resulting from heating or other uses.¹⁰⁷

XVI. Occupational Duties.



Schematic of a “wash apron”

and is mixed with water to remove accumulations of oils, grease, and dirt from the underside of the vehicle chassis and the engine block.”¹⁰⁹ According to a 1983 operation and maintenance manual, “almost every Marine Corps unit throughout Base operates at least one wash apron for cleaning of vehicles, tanks,¹¹⁰

After being in the field, the Marines pulled their vehicles up onto ramps of varying sizes in the motor pools to clean them, a requirement of a wash after deployment mandated by commanders.¹¹¹ As one 1985 document about an automotive maintenance shop described, “During field exercises tanks and other vehicles can ‘pick up’ large accumulations of dirt and sand. Before entering the

Various groups used water in their everyday jobs. Marines, their family members, and civilians worked in laundry facilities, fire stations, hair salons, dentists, hospitals, bakeries, meat preparation facilities, and a number of other locations using water. For example, some worked at vehicle maintenance shops. They would use a “steam jenny,” or portable steam unit, also used in the laundry facilities,¹⁰⁸ to clean vehicles on base. A 1978 document summarized the process stating that, “Wash aprons use steam and water for cleaning automotive and military vehicles. Steam is generally supplied from a portable ‘steam jenny’

¹⁰⁶ *The Globe*, 16 August 1984.

¹⁰⁷ U.S. Marine Corps, “Training Activities at Camp Lejeune,” 31 October 1961, U.S. Marine Corps Film Repository, Research Collections, University of South Carolina.

¹⁰⁸ *The Globe*, Camp Lejeune, N.C., Jan. 8, 1953, Bates 00897_PLG_0000053480 to 00897_PLG_0000053486.

¹⁰⁹ Austin Brockenbrough and Associates, Consulting Engineers, “Oil Spill Prevention Control and Countermeasures Plan,” 1 March 1978, Bates CLJA_NAVLANT-0000007914 to CLJA_NAVLANT-0000008011.

¹¹⁰ Austin Brockenbrough and Associates Consulting Engineers, “Oil Spill Prevention Control and Countermeasures Plan,” 1 March 1978 [CLJA_NAVLANT-0000007914].

¹¹¹ U.S. Marine Corps, Utilities, Energy and Environmental Division, Atlantic Division, “Engineering Study to Correct Existing Operational and Environmental Discrepancies, Building 1450, at Marine Corps Base Camp Lejeune, North Carolina,” December 1982 [CLJA_LANTDIV01-000000555].

parking, area or maintenance shop these vehicles must be cleaned.”¹¹² The maintenance shop referenced possessed three steam hydrants that they used for the cleaning of the dirty vehicles.

Other documents across the base reflect similar uses of steam and wash aprons throughout Camp Lejeune. In 1980, one maintenance shop requested the construction of a 6,370-foot overhead steam line. A schematic of one maintenance facility required six 20-by-40-foot concrete wash aprons with water and steam outlets and one 20-by-60-foot concrete wash apron with water and steam outlets. Other documents from the 1970s contain pages listing the wash aprons and their locations on base, indicating widespread usage of these types of cleaners across Camp Lejeune.¹¹³

There were many people who remembered working in the motor pools for periods of time while at Camp Lejeune. Mr. McElhiney remembered working in the motor pool cleaning vehicles for five days a week, Monday through Friday, for an average of four hours a day. When asked about vapor related to the use of water to clean vehicles, he said, “It’s fair to say I was drenched.”¹¹⁴ During the months when temperatures and humidity soared at the base, those working in the motor pools dealt with the heat and humidity, increasing their water consumption and need to shower and wash. The same was true across the base for others such as those who worked in the kitchens.

XVII. Ventilation and Maintenance Issues.

In addition to the aforementioned ventilation issues in the dining and laundry facilities, many living areas had historically documented issues with excess humidity and poor ventilation. Historical records reflect discussion of matters such as moist air, humidity and standing water. For example, a 1981 report on mildew and excessive moisture in various buildings noted such issues at the Camp Lejeune barracks. The report noted that an onsite survey had been conducted during August 1981 to determine the extent and source of excessive moisture and mildew in buildings that mainly were unaccompanied enlisted personnel housing. The survey included buildings at Hadnot Point and the hospital complex. The presence of “mildew and excessive moisture” varied among rooms and buildings. Some occupants had showers and lavatory areas that “allow the water to flow from the faucet or shower head as hot as they can endure” and “the hot water can flow into the shower stall and lavatory at the high temperature resulting in excessive moisture added to the space.”¹¹⁵ The report noted how in some buildings the same switch would turn on and off both the light and the fan, meaning personnel would “turn off the light when they leave the toilet area which also stops the exhaust fan before the space is properly ventilated following use of the shower.” Other problems included clogged fan coil units in the barracks “resulting in the unit acting as a humidifier

¹¹² U.S. Marine Corps, Director, Natural Resources and Environmental Affairs Division, “Request for Information,” 18 July 1985 [CLJA_Watermodeling_07-0001133623].

¹¹³ U.S. Marine Corps, “MILCON Projects,” 1980 [CLJA_Watermodeling_07-000112575]; U.S. Marine Corps, “Plans with Plumbing and Mechanical Requirements,” 1998 [CLJA_Watermodeling_07-0001248536]; U.S. Marine Corps, Series of Maps for the Base, 30 June 1979 [CLJA_Watermodeling_07-0001352246]; Commanding General of Camp Lejeune, R. McC. Tompkins, to Commandant of Marine Corps, General Wallace Greene, “Consolidation of Support Services in Camp Lejeune Area,” 24 February 1971 [CLJA_Watermodeling_07-0001138692].

¹¹⁴ “Declaration of Gary McElhiney: *In re*: Camp Lejeune Water Litigation,” 25 November 2024, 1-4.

¹¹⁵ U.S. Marine Corps, Atlantic Division, Naval Facilities Engineering Command, “Report on Study Concerning Mildew and Excessive Moisture in Various Building at the Marine Corps Base, Camp Lejeune, North Carolina,” 19 October 1981 [CLJA_Watermodeling_07-0001284958-CLJA_Watermodeling_07-0001285095]

rather than providing dehumidification control.” The report also found that “[h]ot moist air from some of the laundry rooms (from dryer vents and wall exhaust fans) is able to enter those sleeping rooms near the laundry room.” Additionally, there were areas where water accumulated in laundry rooms, the presence of “inoperative exhaust fans,” and “[d]oors to common bathroom propped open allowing hot moist air to enter sleeping rooms,” and “condensation on the front window walls of the sleeping rooms.”¹¹⁶ The report listed different buildings in Hadnot Point with handwritten notes about issues such as mold growing on walls, ceilings, and lockers; dripping AC units; water stains near the laundry units indicating leakage; and others.

Another report, dated 1981, noted that some of the moisture and mildew problems were longstanding, e.g., “From observations of Bldgs. M614 and M616, it appears mildew and excessive moisture problems have existed in the central bathroom areas for some time.”¹¹⁷ Government officials concluded: “The key to mold control is moisture control.”¹¹⁸

A “Final Report on High Humidity/Moisture Conditions Miscellaneous Buildings Camp Lejeune, North Carolina” (July 1983) noted the “purpose of this study and report has been to establish that a humidity/moisture problem does exist. It found “on-going complaints regarding high humidity/high moisture content within the conditioned space of several buildings at Camp Lejeune, North Carolina. Associated with the high humidity conditions has been the prevalent occurrence of property damage from mold/mildew.” “An inordinately high number of toilet exhaust fans were encountered at the buildings inspected which were inoperative. . . Failure of the exhaust systems has great impact on the amount of moisture from the toilet/shower areas which is retained within the building as a latent heat load.” It concluded: “Air quality is also impaired due to proliferation of odors throughout the building. The extent to which failed exhaust fans were encountered suggests that insufficient regimen of preventive and general maintenance is occurring.”¹¹⁹

The Marines concurred with the appraisal of the report which highlighted problems with ventilation at different points on the base, but especially the barracks. One Marine observed that he always just assumed that the exhaust fans in the barracks bathrooms did not work. When he walked back from the shower to his barracks room, “you just started sweating because [there was] no air moving in the barracks.”¹²⁰ For some time, there were few fans to circulate air in parts of the base, especially the older barracks and buildings at Hadnot Point. When the Marines began using air conditioning more prominently, the Marine Corps nonetheless limited its use. One document reported that, per energy conservation, the base set the thermostats to 78 degrees in the summer and only allowed air conditioning to run when it reached 85 degrees.¹²¹

¹¹⁶ Ibid.

¹¹⁷ Ibid.

¹¹⁸ U.S. Environmental Protection Agency, “Can Mold Cause Health Problems?” 14 October 2024, <https://www.epa.gov/mold/can-mold-cause-health-problems> [accessed 1 December 2024].

¹¹⁹ Darrell S. Larsen, Mechanical Engineering Branch of the Naval Facilities Engineering Command, “Final Report on High Humidity/Moisture Conditions Miscellaneous Buildings, Camp Lejeune, North Carolina,” 29 July 1983 [CLJA_Watermodeling_07-000134879-CLJA_Watermodeling_07-001375308.pdf]

¹²⁰ “Declaration of Gary McElhiney: In re: Camp Lejeune Water Litigation,” November 2024, 1-4.

¹²¹ U.S. Marine Corps, Commanding General to Distribution List, “Utilities and Energy Management Plan,” 2 June 1982 [CLJA_Watermodeling_07-0001245213-CLJA_Watermodeling_07-0001245244.pdf].

Ventilation issues extended to family housing. Some homes in older neighborhoods had been built quickly, resulting in prolonged issues. The article excerpted below from *The Jacksonville Daily News* shows that Tarawa Terrace residents were experiencing health problems due to mold and mildew issues in their homes, causing the “ventilation of some base residences [to be] questioned,” even after having better air conditioning and updates to bathrooms and kitchens.



News article on ventilation issues at Tarawa Terrace dating back to 1980s, *Jacksonville Daily News*, 18 March 1990.¹

Historical documents also reflect that at times, Marines were required for energy conservation purposes to keep windows and doors shut while the heat was on, from approximately the third week in October to the first week in April.¹²²

XVIII. Recapitulation of Findings.

1. There is a long history of the U.S. military designing its bases to contain its service members and their dependents within base boundaries. If occupants spent more time on the base grounds, they inferably had more time near its water, versus during time spent outside the boundaries of the base. Clearly, as the previous narrative notes, this was very much the case at Camp Lejeune. What I uncovered through intensive research in primary and secondary materials was that Lejeune was a complex organism, relatively isolated from the outside world by its location. In many ways, it was a self-contained county with multiple neighborhoods, such as Tarawa Terrace, Holcomb Boulevard, Camp Johnson / Montford Point,¹²³ with thousands of residences whose inhabitants frequented locations across the base, but especially the “county seat” of Hadnot Point, for medical

¹²² Base Order 11300.1G, p. 3, June 2, 1982, Bates CLJA WATERMODELING 07-0001245213 to CLJA WATERMODELING 07-0001245244.

¹²³ In addition, important communities and areas on the base included Courthouse Bay (location of Marine Corps engineer schools), Onslow Beach (where recon was historically), New River (where an air station is located), Camp Geiger (site of infantry training), and the Rifle Range area (a functional rifle range with a small but permanent staff). In certain ways, all of these spread-out camps were dependent on the existence of Hadnot Point as the “County Seat.” (Source: Ensminger).

services, food and other goods, entertainment and cultural experiences, schools, and for many other reasons. It was, and has remained, a vibrant, integrated community, insular and to some extent self-contained.

2. A substantial part of the overall demographic historically was young, male Marines (under the age of 25) or young families with children. The lack of adequate pay and lack of a need to drive off the base meant most typically lacked cars during much of the relevant years. Marines and others relied on the bus system and walking to access different services on base. It was very different from ordinary American environments today in which cars are ubiquitous. But it reflected the times and resulted in the Marines spending more time on base, spending their money at the PXs, local restaurants and taking time for rest and relaxation in the plethora of sports and entertainment facilities maintained by the Marine Corps.

3. As a related aspect to the base historically being self-contained, there were ample opportunities for social, recreational, and other such events on base, including at facilities geographically located in living areas such as Tarawa Terrace, Midway Point, and Holcomb Boulevard during the relevant period. Many Marines lived in the barracks at Hadnot Point, the nerve center of the base. Marines, their wives and dependents, came from the on-base neighborhoods to Hadnot Point to work, shop, attend religious services, enjoy clubs and entertainment, go for medical care, and participate in many other activities and tasks. Children went to on-base schools. The residents drank from the tap water sources, ate meals and consumed drinks prepared with the water, and swam at the local pools.

4. Research and investigation into sources of historical records and facts, including access to public record archives, documents produced in the CLJA action, and oral histories and testimony of Marines and spouses, reveals the existence of numerous historical facts reflecting the nature of the drinking water uses on the base during the pertinent times. These have been employed and discussed above to develop a narrative encapsulating the everyday lives of Marines and their dependents who spent time at the base during the period under review.

5. Certain features of particular areas, such as shower rooms in barracks, motor pools and mechanic buildings, and scullery and mess hall facilities, reflect an association with steam and water use in the historical documentation and recollections of service members.

6. Historical records and recollections of Marines' daily tasks, activities and duties reflect the presence of numerous outdoor activities, including during warm and hot weather periods, accompanied by the use of canteens and water buffaloes, water stations, and water fountains, Marines on base experienced significant physical exertion during training, both during weeks at the barracks and in field training. Their commanders ensured they remained hydrated with water provided mainly from sources at Hadnot Point. They also bathed in it, washed their wounds with it, and otherwise used it.

7. Likewise, historical records document daily-life and social activities of spouses, children, and civilians that would have involved for instance, spending time at base-located schools that used base water systems, using recreational swimming pools that used base water systems, and engaging

in activities like going bowling, going to movies, going to buy necessities at the commissary facilities, using medical facilities and so forth, which gave rise to opportunities for water use. Like their military spouses, the family members spent time in recreational activities across the base, both in neighborhoods like Tarawa Terrace and at Hadnot Point. Base areas had baseball, football, and soccer fields and indoor and outdoor basketball facilities. Water was provided in canteens, big jugs, and water buffaloes.

8. The case of the water at Camp Lejeune has gathered significant attention. From my long-term study of the military, and my focus on Camp Lejeune over the past year, I have sought to summarize pertinent aspects of how it operated from its inception in World War II until the 1980s. That is what I have endeavored to report herein. My report highlights the historical facts available informing the water use process on base based on my research and examination of available facts and historical documents and my knowledge in military history and the histories of military bases. It seeks to provide a detailed narrative of the important water issues and access throughout the Marine Corps Base Camp Lejeune. I reserve the right to supplement my report to the extent additional facts, documents and testimony become available and as may be appropriate as the matter proceeds.

XIX. Appendix 1: Research Methodology

I have conducted extensive research on the history of Camp Lejeune. I began by examining the secondary materials on the topics. First, I consulted a large number of works including those on the history of the Marine Corps, some of which I knew from earlier research including Allen Millet's *Semper Fidelis: The History of the United States Marine Corps* and Edwin Howard Simmons and Charles Waterhouse's, *The United States Marines: A History*, but also some new ones such as Victor Krulak, *First to Fight: An Insider View of the U.S. Marines Corps* and Jon Hoff, *USMC: United States Marine Corps: A History*, Thomas E. Ricks, *Making the Corps*, and James B. Wolfe, *Into the Crucible: Making Marines for the 21st Century*.

Once the macro story of the Marine Corps presented itself through these secondary sources, I dug deeper into the history of military bases, including Marine bases, in the United States and around the world to better comprehend the nature of living on them. Again, I relied on many years of accumulated knowledge from my research and teaching to inform the narrative from many books such as ones on domestic bases including those on Army bases such as Kenneth MacLeish, *Making War at Fort Hood: Life and Uncertainty in a Military Community*, Matthew Rector's *The United States Army at Fort Knox*, and Peggy Stelpflug and Richard Hyatt, *Home of the Infantry: The History of Fort Benning*. For international bases, my research included those such as and for Jonathan Stevenson's *Overseas Bases and U.S. Strategy: Optimizing America's Military Footprint*, Catherine Lutz, *The Bases of Empire: The Global Struggle Against U.S. Military Posts*, Rebecca Herman, *Cooperating with the Colossus: A Social and Political History of U.S. Military Bases in WWII Latin America*, and Jonathan Hansen, *Guantanamo: An American History*. I also consulted M.A. theses and dissertations as well as journal articles and essays in books. All these provided snapshots of life on a U.S. military base spread over nearly 150 years, something reinforced by my personal visits to many military bases over the past thirty years, both working ones as well as historical state and national parks spread over the country.

With a grounding in the macro story of military bases, I continued to narrow my focus on only Marine bases, primarily in the United States to start to narrow my subject, many obtained over the years in research for books and teaching classes. For the Marines, I consulted works such as Bradley Gernand, *Quantico: Semper Progređi, Always Forward*, Charles A. Fleming and Robin Austin, *Quantico: Crossroads of the Marine Corps*, and Verle Ludwig, *U.S. Marines at Twentynine Palms, California*. These books provided a good framework for life on Marine bases and how it evolved, particularly during WWII and later the Cold War when the Marine Corps grew significantly and expanded its role in U.S. military policy and foreign relations. The comparative analysis also helps place Lejeune into the overall historical narrative of development of the bases.

For Camp Lejeune, I reviewed many secondary works, both those related to the history of the base and specifically the water issues. For general histories, I referenced works such as Gertrude Carraway, *Camp Lejeune Leathernecks*; William Darden, "Camp Lejeune," in *United States Navy and Marine Corps Bases*; Thomas Loftfield, *An Archaeological and Historical Reconnaissance of U.S. Marine Corps Base, Camp Lejeune*; Louis Berger Group, *Semper Fidelis: A Brief History of Onslow County, North Marine Corps Base, Camp Lejeune*, Kenneth E. Dunn, *Camp Lejeune Command: Commanders Notes*, and Melton McLaurin, *The Marines of Montford Point: America's First Black Marines*. Each provides a good overview of the development of the base, its geography, and evolution, including life on the base during the period after its creation in 1941.

There were sources that specifically related to the water cases, including articles and theses. They review the history of the base and then the issues that arose and why. They include Mike Magner, *A Trust Betrayed: The Untold Story of Camp Lejeune and the Poisoning of Generations of Marines and Their Families*, Robert O'Dowd, *A Few Good Men, Too Many Chemicals: Toxic Exposure of U.S. Marines and Government Lies*, and George Swimmer, *Deadly S.N.A.F.U.: Marine Corps Base Camp Lejeune, N.C.* The theses including Kevin Boyce, "Troubled Waters: A History of Camp Lejeune's Toxic Legacy" and Michael Partain, "Camp Lejeune Digital Community Archive Project: An Analysis of Digital Public History Efforts to Achieve Social Justice for Camp Lejeune Drinking Water Contamination, 1999-2017." Other works include those such as Lori Freshwater's "What Happened at Camp Lejeune" in the *Pacific Standard* and Leo Shane III's "Now that the PACT Act Has Passed, How Soon Will Veterans See Their Benefits," in *Military Times*.

From these secondary readings, I gained a foundational understanding of many topics related to military bases. Once completed, I began intensive research into the primary documents on life at Camp Lejeune in the postwar period. These included a major research trip to the Marine Corps Archives at Quantico, VA, which houses a vast quantity of materials on all the subjects related to the 248-year long history of the Marines. It has a vast bibliography on Camp Lejeune, especially related to the private collection of people stationed there from WWII through the 1980s. I reviewed forty different private collections of people with ties to Camp Lejeune, many with multiple folders of materials that included letters, photographs, slides, and other personal materials. Some had additional information, such as manuals and guides to the base. In addition, I reviewed 17 different boxes and folders of photographs ranging from those of the mess halls, aerial photos of the base, the chapels, the hospital, and recreation facilities and activities. Finally, I obtained copies of Command Chronologies relating to the base from the 1960s until the 1980s. These primary sources

helped in the creation of a historical record of change over time from 1942 through the 1980s, including infrastructure and daily life.

A review of primary documents included works that covered life at Camp Lejeune such as the base newspaper, *The Globe*. It is a newspaper that the Marine Corps published weekly, covering everyday life on base in great detail, including entertainment, base housing, and a number of events such as sporting and change of commands. I complemented this research with readings of major Marine Corps publications including *Leatherneck* magazine (reviewed at the Marine Corps Library at Quantico), *The Marine Corps Gazette*, and local newspapers such as *The Daily News* (Jacksonville) as well as national news outlets. These materials have many human-interest stories on topics at the base, ranging from the 1950s through contemporary times when the water cases have generated additional interest.

There was also a plethora of primary documents contained in the large number of government documents and those of non-governmental organizations, focused on the topic of the base and often water contamination. They include documents from the Department of Defense, the Department of Veteran's Affairs, the U.S. Congress, the Environmental Protection Agency, Center for Disease Control, Government Accountability Office, Department of Justice, and other agencies. These included testimonies in hearings, pamphlets, and memorandums relating to Camp Lejeune, especially its infrastructure including water distribution. Non-governmental organizations and their primary and secondary materials also played a role in developing an understanding of life at Camp Lejeune. Like their government counterparts, various organizations produced studies that provided an understanding of life on the base and the effects of the water on health. These included groups such as the National Academies of Sciences, Engineering, and Medicine. They have a lot of first-person accounts and the science surrounding various issues, including the water and are more contemporary in nature, making them somewhat more reliable than memories from fifty years or more earlier.

Finally, with a much fuller understanding of the secondary and primary documents, my focus shifted to other forms of first-hand accounts, principally depositions and oral histories, but also memoirs of people who served there. These materials provided background information and also a form of oral history from those who testified in front of various congressional hearings, military commissions, and other governmental groups, including the Environmental Protection Agency. Building on a methodology outlined in books including Don Ritchie (former chief historian of the Senate), *Doing Oral History: A Practical Guide* and Barbara W. Sommer and Mary Kay Quinlan, *The Oral History Manual* along with good examples of oral history collections such as Studs Terkel, *The Good War: An Oral History of World War II* or Christian Appy's *Patriot's: The Vietnam War Remembered from All Sides*. I have more than thirty years of experience employing oral history within almost all of my 11 books. I have studied and learned about conducting, recording, and compiling them, understanding some limitations but, simultaneously, their value, particularly when corroborated by other primary or secondary sources. In many ways, conducting these is the last step in the methodology employed as you need a good grounding in the materials before proceeding with oral histories.

I have also been provided with copies of the master complaint, master answer, and various background documents on the base history and water contamination issues from agencies such the ATSDR,⁷⁶ EPA⁷⁷ and GAO.⁷⁸ In addition, I was provided with copies of depositions and declarations provided by three (Gary McElhiney, Allan Howard, Jacqueline Tukes) of the 25 named Plaintiffs whom I am advised constitute the “track one” Plaintiffs for the CLJA claims. They reflect two men and one woman who resided at the base at distinct time periods in the earlier 1970s, the later 1970s, and the 1980s. One resided at Hadnot Point, one at Tarawa Terrace, and one spent time at both communities. I have also been provided with various additional reliance materials consisting of documents either produced during the CLJA lawsuit or located in public records, as are discussed below. I have also been provided with oral history interview information from one or more individuals as indicated below.

With all these materials, I have concentrated on writing a narrative about everyday life on Camp Lejeune, especially peoples’ interaction with water. The vast quantity of sources as well as their diversity have allowed me to create such a narrative that recognizes individual experiences determined by personal issues and time but also the many overlapping narratives that characterize the research that bring together far more commonalities than individual differences, all acknowledged during the writing of the narrative as well as the section on the interaction between water and people on the base that follows.

XX. Appendix 2: History of U.S. Military Bases.

Since colonial times, the landscape of America’s frontiers and coastal lands have been heavily populated with military bases. They have been designed as defenses first against England’s European enemies, France and Spain, as well as the Native Americans. Many of the major U.S. cities such as Pittsburgh and Detroit developed as forts where trade and daily life interacted with defense. Other major cities such as New York City and Charleston, South Carolina, became large naval bases with intricate connections to forts and naval defenses.¹²⁴ When the United States became an independent nation in 1783, it maintained many of the British defenses and added to them, such as via the Northwest Territory and the Louisiana Purchase in 1803. New forts sprung up such as the St. Louis Arsenal, Fort Boonesborough and Fort Smith.¹²⁵ The process continued with the westward expansion after the Mexican-American War with major installations on the

¹²⁴ Alexander Humes, “Fortified Arguments: Fortifications and Competing Spatial Views of Colonial North America,” Ph.D. dissertation, University of Virginia, 2021; David La Vere, *The Tuscarora War: Indians, Settlers, and the Fight for the Carolina Colonies* (University of North Carolina Press, 2013); Eric Klingelhofer, *First Forts: Essays on the Archaeology of Proto-Colonial Fortifications* (Brill Publishers, 2010); “Holding Fort Against Time: Rebuilt Military Barracks, Pennsylvania Battlefields Recall Forgotten Conflict in America’s Colonial Era,” *The America’s Intelligence Wire*, 2010; Daniel Patrick Ingram, *Indians and British Outposts in Eighteenth Century America* (University Press of Florida, 2012).

¹²⁵ M. Patrick Hendrix, *A History of Fort Sumter: Building a Civil War Landmarks* (History Press, 2014); Kathleen Troost-Cramer, *True Tales of Life and Death at Fort Adams* (History Press Library Editions, 2013); William Whittaker, ed., *Frontier Forts of Iowa: Indians, Traders, and Soldiers, 1682-1862* (University of Iowa Press, 2009); Donna Hechler Porter, *The Big Siege of Fort Boonesborough and the Winning of the American West* (independently published, 2023); Charles Rivers Editors, *Fort Dearborn: The History of the Controversial Battle of Fort Dearborn during the War of 1812 and the Settlement that Became Chicago* (CreateSpace, 2016); Mike Bunn, *This Southern Metropolis: Life in Antebellum Mobile* (NewSouth Books, 2024).

West Coast such as the Presidio in San Francisco and San Diego naval station. More land forts strung the Mexican border from Fort Bliss to Fort Huachuca and also along the frontier such as Fort Collins and Fort Douglas in Utah. In many cases, these bases remained fairly isolated from major towns (with exceptions like Fort Bliss) and were self-contained entities dependent on the support of the U.S. government, especially the Quartermaster Division, which provided food, goods to buy at the local PX including clothes, dry goods, and other needs. Their isolation ensured that while small communities sometimes arose around them, the majority of soldiers' time was spent on base. They were often paid in scrip rather than dollars. Many of the bases ultimately sheltered families of the soldiers, with housing provided as well as medical care, education and entertainment and cultural opportunities.¹²⁶

By the end of the 19th Century, the overseas expansion of the United States with the Spanish American-Cuban-Filipino Wars (1898-1903) ensured significant changes. The United States now extended its reach with bases in Puerto Rico, Cuba, Guam, Hawaii and the Philippines. The Marine Corps received "the missions of seizure and defense of advanced naval bases, as well as land operations incident to naval campaigns," and "development of amphibious warfare doctrines, tactics, techniques, and equipment employed by landing forces."¹²⁷ For nearly thirty years, the Marines utilized bases in Latin America including the Panama Canal Zone to launch a series of interventions, including in Nicaragua, Mexico, the Dominican Republic, as well as China and the Philippines (and preparing for war with Japan). These bases, just like those back home, were often isolated from local populations and self-contained and sufficient entities.¹²⁸

Military bases sprouted up through the country with the involvement of the United States in WWI and WWII. Many were on the East Coast and in the south, nearer the fighting in Europe. These bases, sometimes hastily constructed initially, included Fort Bragg (now Fort Liberty) and Camp Benning, Georgia (now Fort Moore) along with the Marine Recruit Depot at Parris Island.¹²⁹ The process accelerated during WWII when 25 million Americans served. All across the country, the military initiated a huge buildup of military bases including Fort Hood (now Fort Cavazos) Texas, Fort Carson, Camp Pendleton, California, and Camp Lejeune. They were often isolated from population centers as the government bought cheaper land for the sprawling bases and, seemingly

¹²⁶ Ethel Jackson Price, *Fort Huachuca* (Arcadia Publishing, 2004); Thomas R. Buecker, *Fort Robinson and the American West, 1874-1899* (University of Oklahoma Press, 2003); Robert Wooster, *Frontier Crossroads: Fort Davis and the West* (Texas A&M Press, 2005); James Evetts Haley and H.D. Bugbee, *Fort Concho and the Texas Frontier* (Literary Licensing, 2012); John D. McDermott, *Dangerous Duty: A History of Frontier Forts in Fremont County, Wyoming* (Fremont County Historic Preservation Commission, 1993).

¹²⁷ U.S. Marine Corps, "History of Camp Lejeune," <https://www.lejeune.marines.mil/Offices-Staff/Environmental-Mgmt/Cultural-Resources/History-Live/History-of-Camp-Lejeune/> [accessed 10 October 2024].

¹²⁸ Katherine A. Zien, *Sovereign Acts: Performing Race, Space, and Belonging in Panama and the Canal Zone* (Rutgers University Press, 2017); M. Gerald Anderson, *Subic Bay: From Magellan to Pinatubo: A History of the U.S. Naval Station* 4th edition (CreateSpace, 2009); Stephen Irving Schwab, *Guantanamo, USA: The Untold History of America's Cuban Outpost* (University of Kansas Press, 2009); Alfred Peredo Flores, *Tip of the Spear: Land, Labor, and US Settler Militarism in Guahan, 1944-1963* (Cornell University Press, 2023).

¹²⁹ Edward M. Coffman, *The War to End All Wars: The American Military Experience in World War I* (University of Kentucky Press, 1998); Matthew D. Rector, *The United States Army at Fort Knox* (Arcadia Publishing 2005); H.W. Crocker III, *The Yanks Are Coming!: A Military History of the United States in World War I* (Regnery Press, 2014); Peggy A. Stelpflug and Richard Hyatt, *Home of the Infantry: The History of Fort Benning* (Mercer University Press, 2007).

overnight, the bases became self-sufficient and contained entities complete with entertainment facilities, barracks, mess halls, hospitals, and family housing. Even as conflict ended in 1945, many of the bases continued their expansion over the following decade.¹³⁰

This building of bases continued in the postwar era as the Cold War emerged between the United States and the Soviet Union. The military provided stores, schools, security, housing, and everyday entertainment facilities as well as huge warehouses, motor pools, and construction battalions housing millions of Americans around the country and globe. Cities around bases flourished with some soldiers living off base, particularly in larger urban areas such as in San Diego or the San Antonio area. Most stayed in subsidized housing on base doing their jobs while interacting with base entertainment, social, schools, and dining facilities.¹³¹ The same occurred overseas in places such as Great Britain, West Germany, Okinawa, and South Korea. Millions cycled through the bases during the Cold War, including large numbers of draftees through 1974 when the country switched to an All-Volunteer Force. Those at bases overseas often remained cut off from the host country due to language and cultural barriers but had everything they needed on base including subsidized food and goods. Commanders restricted their movement also to limit risk of misbehavior by GIs that could endanger relations with the host. The goal was also to limit U.S. dollars going off base and/or causing inflation for local economies. The isolation also often existed because of tensions between the Americans and the locals as one foreigner once complained about Americans for being “oversexed, overpaid, and over here.”¹³²

New commitments followed with subsequent military interventions and U.S. military buildups during the time periods of Korea, Vietnam, and the wars of the Middle East in the late 20th and on into the 21st Century. Over the years, millions of Americans have served, and have resided, often accompanied by their families, on bases in the United States and across the globe. Again, the isolation of life on the base with regard to surrounding communities was compensated for by the organizational and financial structures which encouraged people to interact on base and rewarded them for doing so. The continuities between experiences, whether at a frontier fort out west in the 19th Century, or at Camp Lejeune, North Carolina, today, are in fact, in some respects, quite strong. Understanding the long history of camp and installation development over our national history accordingly informs our understanding of the context for water uses at the base.

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¹³¹ Kenneth MacLeish, *Making War at Fort Hood: Life and Uncertainty in a Military Community* (Princeton University Press, 2013); “U.S. Military Buildup of Thule and DEW Line,” Beaufort Gyre Exploration Project, <https://www2.whoi.edu/site/beaufortgyre/history/us-military-buildup-of-thule-and-dew-line-1950s-1960s/> [accessed 11 November 2024].

¹³² John W. Lemza, *American Military Communities in West Germany: Life in the Cold War Badlands, 1945-1990* (McFarland, 2016); Stephen Hugh Lee, *Outposts of Empire: Korea, Vietnam and the Origins of the Cold War in Asia, 1949-1954* (Liverpool University Press, 1996); Jonathan Stevenson, *Overseas Bases and U.S. Strategy: Optimizing America's Military Footprint* (Routledge, 2022); Catherine Lutz, *The Bases of Empire: The Global Struggle Against U.S. Military Posts* (New York University Press, 2009).

SIGNATURE PAGE:

Dated: 12/7/24

Kyle Longley
Dr. Kyle Longley

KYLE LONGLEY, PHD

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Kyle Longley, PhD

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This listing is based on a reasonable search, and I reserve the right to amend at a future date should it become necessary.

Statement of Compensation-Kyle Longley, PhD - Expert Witness

My rate is \$350 per hour. I do not have any additional differentiation beyond research for testimony or deposition.

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Expert Report of Dr. Kyle Longley
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ERRATA SHEET – 12/7/24 REPORT.

With regard to my expert report dated 12/7/24, I make the following corrections:

1. The citation to President Nixon visiting Lejeune is incorrect and should be deleted. Report p. 13 & n. 26, and reliance list number 143.
2. At page 10, the photo caption reading “Water Treatment Plant near Holcomb Boulevard, 1960s” should read “Water Treatment Plant near Holcomb Boulevard.”
3. At page 34, the photo caption reading “Marines fill water buffalo, Hadnot Point” should read “Demonstrative photo of water buffalo.”

Dated: 8/3/25



Kyle Longley, Ph.D.